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NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY
PENSACOLA, FLORIDA

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SUMMARY PAGE

THE PROBLEM

Airsickness in Naval Flight Officer (nonpilot) training squadrons can be considered to be a significant biomedical risk having both direct and indirect influence on the cost of training aircrew personnel. During flight, airsickness can degrade student performance and sometimes necessitate repeat flights to achieve training objectives. Additional dollar costs also result when students attrite because of airsickness, with these costs rising rapidly when the attritions occur late in the training program or even later in fleet assignments. Until this study was initiated, there were no quantitative flight data available to describe the relative magnitude of the airsickness problem either within or across the many individual basic (primary), advanced (secondary), and fleet readiness squadrons (FRS) comprising the Naval Flight Officer (NFO) flight training program prior to fleet assignment. This information is required to define the motion stress associated with each of the major NFO training pipelines so as to establish selection criteria that will optimize the assignment of NFO candidates to type-specific fleet aircraft according to individual airsickness susceptibility. In this respect, there has been the need for research to develop candidate biomedical tests of motion sickness susceptibility as well as operations-based procedures that will provide inflight validation criteria for establishing the relative effectiveness of each candidate test undergoing development.

To address these problems, a longitudinal study was initiated to investigate airsickness in the basic, advanced, and mission-specific fleet readiness squadrons (FRS) comprising the initial phase of the NFO training program. Flight data, based upon instructor and/or student judgments of airsickness severity were collected in these squadrons on an individual student basis. In addition, a large segment of the sample population was exposed, prior to beginning flight training, to several candidate tests of motion sensitivity which were evaluated for relationship to subsequent flight data. Six previous reports have detailed the incidence and severity of airsickness experienced during basic and advanced training and related the inflight airsickness data collected from the individual students to their performance on the candidate motion reactivity tests.

FINDINGS

This report documents the incidence and severity of airsickness experienced in 14 different fleet readiness squadrons (FRS) by 372 NFO students who flew a total of 8,325 hops during this phase of training. Treating this entire population as a single group, airsickness was reported to have occurred on 637 (7.65 percent) of the 8,325 hops, vomiting on 252 (3.03 percent) of the hops, and inflight performance degradation due to airsickness on 303 (3.64 percent) of the hops. Though these figures

are lower than those reported previously for the student NFOs during their basic and advanced phases of training, the FRS data showed significant variations according to the type-specific aircraft training pipeline followed by the students. Particularly noticeable was the high incidence of airsickness that occurred in the P-3 pipeline during FRS training. The report discusses probable causes for these pipeline variations based upon differences in the flight syllabi associated with each phase of training within a given pipeline. The report also relates student performance on the candidate motion reactivity tests to inflight airsickness performance during different phases of training.

ACKNOWLEDGMENTS

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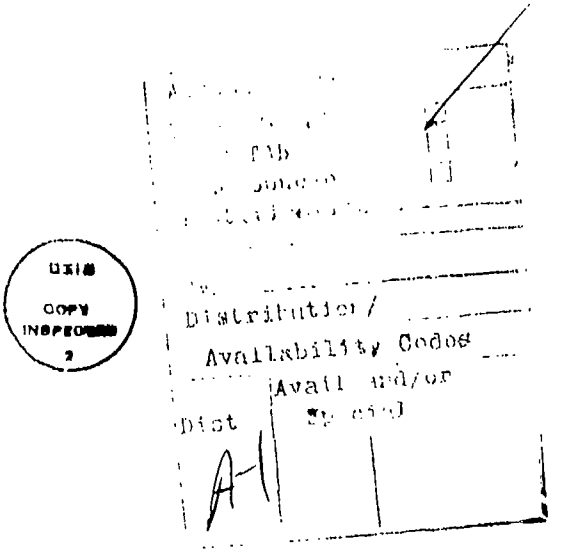

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INTRODUCTION

This report marks the conclusion of a longitudinal study of airsickness in a large sample of Naval Flight Officers (NFO) being trained to perform various nonpilot flight duties prior to assignment to operational fleet squadrons. The study has concentrated on the acquisition of airsickness data on an individual subject basis as training progressed from the basic (primary) level through the advanced (secondary) level to the fleet readiness squadron (FRS) phase for each of the major training pipelines.

The primary objectives of the study have been to define the relative magnitude of the airsickness problem during each phase of the NFO training sequence on an individual squadron basis; and to identify differences in motion stress exposure associated with the different pipelines that can affect decisions on the initial selection and assignment of NFO candidates.

A secondary objective, based upon the exposure of a large segment of the total NFO sample population to several short tests of motion reactivity prior to beginning flight training, has been to gain insight into the research avenues that must be followed in the future to develop and validate laboratory tests of motion reactivity that will have high predictive value in the identification of airsick susceptible individuals. In this respect, the inflight airsickness data collected during the longitudinal study has served the dual function of identifying the magnitude of the NFO airsickness problem and establishing validation criteria for measurement of the relative effectiveness of each candidate motion reactivity test undergoing evaluation.

Six previous research reports (1-6) described the incidence and severity of airsickness experienced during the basic and advanced phases of NFO training. This report presents corresponding data for the fleet readiness squadron phase based upon the performance of 357 students in fourteen different squadrons.

PROCEDURE

A block diagram of the NFO training pipelines included in the longitudinal study is shown in Figure 1. All NFO candidates receive their basic flight training in Training Squadron TEN (VT10) prior to being selectively assigned to one of four advanced pipelines that lead to type-specific training in 14 different fleet readiness squadrons (formerly identified as replacement air group (RAG) squadrons). Advanced training in the Mather Air Force Base (MAFB) pipeline results in FRS training in P-3 aircraft. In Training Squadron EIGHTY SIX (VT86), students who follow the advanced Jet Navigation (AJN) pipeline receive FRS training in attack/antisubmarine aircraft including the A-6, EA-6, and the S-3; while those who follow the Radar Intercept

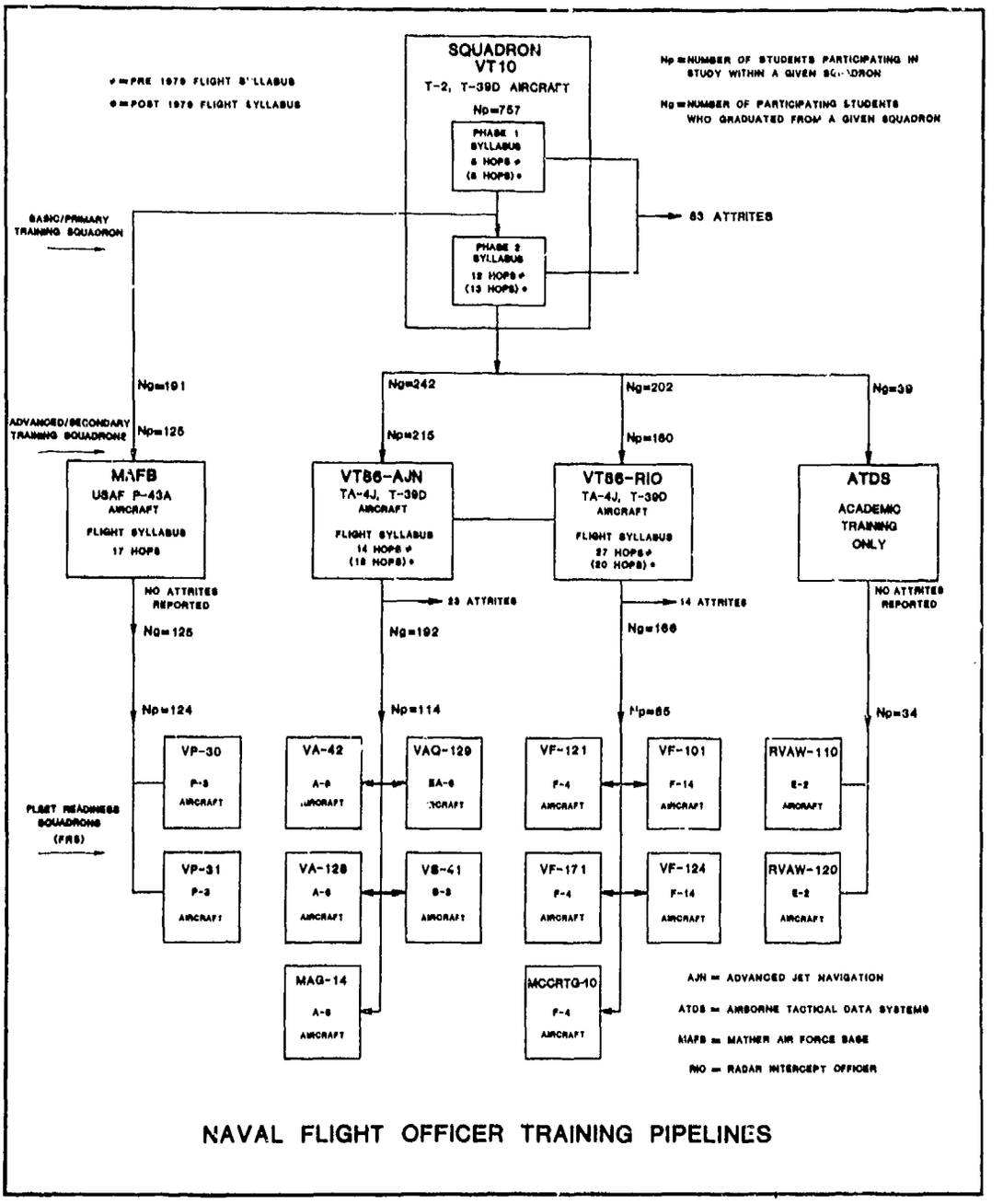

Figure 1

Block diagram showing the major training pipelines followed by Naval Flight Officers as they progress from basic/primary training in Training Squadron TEN (VT10) through one of four advanced/secondary training squadrons to one of fourteen type-specific Fleet Readiness Squadrons (FRS). This report deals with airsickness incidence during the FRS (formerly identified as Replacement Air Group-RAG) phase of training.

Officer (RIO) pipeline are assigned to F-4 or F-14 FRS fighter squadrons. Those students that follow the Airborne Tactical Data Systems (ATDS) pipeline receive FRS training in E-2 squadrons. Upon completion of FRS training, the graduate NFOs are assigned to an appropriate operational squadron for fleet duty.

The longitudinal study was initiated in Squadron VT10 where the incidence and severity of airsickness that occurred on each hop flown by each participating student was documented by means of a questionnaire with separate sections for student and instructor evaluations of the student's airsickness reactions on the given hop. In general each hop (a formally defined component of the squadron flight syllabus with a specific training mission or objective) involved a single flight of the student although there were rare occasions when a student flew two different hops on a single flight (1,4). The same questionnaire was used to gain student and instructor judgments of airsickness for each hop flown during advanced training in the VT86-AJN and VT86-RIO pipelines. For the MAFB pipeline and all of the individual fleet readiness squadrons, a modified questionnaire of the same basic form was utilized to collect corresponding data on an individual hop basis with the exception that only the students rated the incidence and magnitude of their airsickness experiences. With this modified questionnaire, the students were asked to rate their airsickness symptoms as not present, mild, moderate, or severe with these responses scored (weighted) on an integer scale of 0 to 3, respectively. Corresponding scaled judgments were requested for the amount of inflight performance degradation experienced as a result of airsickness. A third question addressed the number of times vomiting occurred on a given hop with zero, one, two, or three or more vomiting incidences being scored on a 0 to 3 scale, respectively. In addition, a yes/no type question asked if the student had used any form of airsickness medication prior to the hop. As outlined in the first report (1) of the longitudinal study the questionnaire responses were then computer-stored on an individual student basis with each student's file containing data describing his performance on the laboratory motion reactivity test battery administered prior to beginning flight training as well as his airsickness experiences during basic, advanced, and FRS training.

Using the questionnaire data as reference, unweighted and weighted indices were calculated for each student for each phase of NFO training. In the event a student submitted less than four questionnaires during a given phase of training, flight indices were not calculated for this phase. The unweighted indices were calculated as

$$\text{UNWEIGHTED INDEX} = \frac{\text{No. Hops Response Experienced}}{\text{Total Number of Hops Flown}} \times 100$$

where no weight was given to the severity of the response; i.e., attention was given only to the fact that a response such as airsickness occurred on a flight without regard to its mild,

moderate, or severe degree of magnitude. Accordingly, the unweighted indices simply represent the percentage of the hops flown by the student where a denoted response such as airsickness occurred.

The weighted indices calculations were based upon the assignment of 0 through 3 linear weights to the four magnitude ratings associated with a given questionnaire item. For example, if a student reported that he was not airsick on a hop, he would have a response rating of 0 for this particular flight; a student who reported either mild, moderate, or severe airsickness was given a response rating of 1, 2, or 3, respectively, for a particular hop. These response ratings were summed for all of the hops flown by a given student and used to calculate a weighted index that was normalized to have a maximum value of 100 as follows:

$$\text{WEIGHTED INDEX} = \frac{\text{Sum (Individual Flight Response Ratings)}}{\text{Total Number of Hops Flown}} \times \frac{100}{3}$$

To illustrate, a student who was never airsick during training would have a weighted airsickness response index of 0.0; a student who was severely airsick on all of his hops would have a corresponding weighted index of 100.00; a student who was mildly airsick on 50 percent of his hops would have an index of 16.7; and a student who was severely airsick on 50 percent of his hops would have an index of 50.0.

FRS AIRSICKNESS INCIDENCE: BASIC QUESTIONNAIRE DATA

The data presented in this report to document the incidence of airsickness during the FRS phase of NFO training are based upon the analysis of 8,325 questionnaires (one questionnaire per hop) submitted by 372 students in 14 different FRS squadrons. The airsickness, vomiting, and performance degradation measures derived from these questionnaires are separately tabulated in Table I for each of these squadrons. In this table, the first row lists the number of hops flown in a given squadron for which questionnaires were received. The second row lists the number of students submitting the questionnaires associated with a given squadron. In the remaining rows, each datum below a given squadron represents the percentage of the total hops flown where the denoted response occurred. The first datum presented for a given response variable, e.g., "Airsickness-Present", is the percentage of hops where airsickness was present without qualification as to the magnitude (mild, moderate, or severe) of the response. The three subsequent data describe the percent incidence of mild, moderate, and severe ratings, respectively, for the questionnaire item. The same format applies to the four performance degradation line items listed in the table. In the

TABLE IA

Percent incidence of airsickness, vomiting, and inflight performance degradation reported during FRS training in two F-14, three F-4, and two E-2 squadrons.

FLIGHT QUESTIONNAIRE DATA	AIRCRAFT... F-14 SQUADRON...VF-101	F-14 VF-124	F-4 VF-121	F-4 VF-171	F-4 MCCRTG-10	E-2 RVAW-110	E-2 RVAW-120
Total Number of Hops Flown	819	1289	352	613	588	244	251
Total Number of Students	18	31	10	14	16	16	19
Airsickness-Present	5.74	3.96	9.37	1.79	5.27	2.05	5.98
Airsickness-Mild	4.03	2.56	5.97	0.98	4.25	0.82	4.38
Airsickness-Moderate	1.46	1.16	3.41	0.65	0.85	1.23	1.59
Airsickness-Severe	0.24	0.23	0.00	0.16	0.17	0.00	0.00
Vomiting-Present	2.80	2.17	2.27	0.82	2.38	0.41	0.80
Vomiting-One time	1.83	1.40	1.99	0.33	1.70	0.41	0.80
Vomiting-Two times	0.73	0.54	0.28	0.33	0.51	0.00	0.00
Vomiting-Three or more times	0.24	0.23	0.00	0.16	0.17	0.00	0.00
Performance Degradation-Present	3.30	1.55	5.68	0.82	1.19	0.41	5.58
Performance Degradation-Mild	2.93	1.16	4.83	0.49	0.85	0.00	5.58
Performance Degradation-Moderate	0.37	0.23	0.85	0.16	0.34	0.41	0.00
Performance Degradation-Severe	0.00	0.15	0.00	0.16	0.00	0.00	0.00

TABLE IB

Percent incidence of airsickness, vomiting, and inflight performance degradation reported during FRS training in three A-6, one EA-6, two P-3, and one S-3 squadrons.

FLIGHT QUESTIONNAIRE DATA	AIRCRAFT... A-6 SQUADRON...VA-42	A-6 VA-128	A-6 MAG-14	EA-6 VAQ-129	P-3 VP-30	P-3 VP-31	S-3 VS-41
Total Number of Hops Flown	847	1017	284	775	430	470	346
Total Number of Students	21	21	10	33	74	54	35
Airsickness-Present	7.19	7.77	23.24	8.90	18.84	12.98	7.80
Airsickness-Mild	5.19	4.72	16.90	6.06	10.70	8.94	6.36
Airsickness-Moderate	2.71	2.06	2.82	1.81	6.51	2.77	1.45
Airsickness-Severe	0.00	0.98	3.52	1.03	1.63	1.28	0.00
Vomiting-Present	3.19	3.93	8.45	4.13	5.35	4.04	1.73
Vomiting-One time	2.12	1.97	6.34	1.93	2.56	2.70	1.73
Vomiting-Two times	1.06	1.38	0.70	1.81	1.63	2.13	0.00
Vomiting-Three or more times	0.00	0.59	1.41	0.39	1.16	0.21	0.00
Performance Degradation-Present	3.90	3.83	8.45	3.48	10.93	5.96	3.18
Performance Degradation-Mild	3.19	2.56	4.58	2.58	7.44	4.04	2.89
Performance Degradation-Moderate	0.71	0.79	3.87	0.77	2.56	1.70	0.29
Performance Degradation-Severe	0.00	0.49	0.00	0.13	0.93	0.21	0.00

case of the vomiting measure, the breakdown is based upon the number of times emesis occurred on a given flight.

As described by the "Airsickness-Present" row in Table I, the percentage of hops where airsickness was reported to have been experienced varied considerably ranging from a low of 1.79 percent in VF-171 (F-4 aircraft) to a high of 23.24 percent in the Marine Squadron MAG-14 (A-6 aircraft). Wide variations also occurred in the percentage of hops where vomiting occurred ranging from a low of 0.41 percent in RVAW-110 (E-2 aircraft) to a high of 8.45 percent in MAG-14. Correspondingly, the percentage of hops where inflight performance degradation due to airsickness was reported ranged from a low of 0.41 percent in RVAW-110 to a high of 10.93 percent in VP-30 (P-3 aircraft). In general these wide variations existed across different types of aircraft as well as within the groups of type-specific squadrons. For example, Table I indicates relatively low airsickness incidence rates of 5.74 and 3.96 percent for the two F-14 squadrons compared to the 18.84 and 12.98 percent rates for the two P-3 squadrons. Similarly, airsickness variations within type-specific squadrons are represented by the 7.19, 7.77, and 23.24 percent incidence figures shown for the three A-6 squadrons.

Treating the 372 students as a single group, the questionnaire data of Table I indicate that airsickness was reported to have occurred on 637 (7.65 percent) of the 8,325 FRS hops, vomiting on 252 (3.03 percent) of the hops, and inflight performance degradation due to airsickness on 303 (3.64 percent) of the hops. The questionnaire item dealing with the use of airsickness medication prior to or during a hop was not tabulated in Table I because of low reported incidence. In fact, only two students reported using airsickness medication during FRS training. One of these students used medication on two hops and the other on three hops.

AIRSICKNESS INDICES - ALL FRS SQUADRONS COMBINED

As with the previous reports (1-6) of the longitudinal study, unweighted and weighted flight indices were calculated for each individual student during the FRS phase of his NFO training. The function of these indices has been to allow comparisons to be made among different squadrons and among different training pipelines. In addition, they serve the further function of relating an individual's performance during basic/primary training with subsequent performance in advanced/secondary and fleet readiness squadrons. The resulting group statistics, based upon the individual performance of each participating student, are presented in Table II. Statistical parameters listed for each response variable include the group mean, standard deviation of the observations, standard error of the mean, minimum and maximum values observed, group median, the total number of observations (students) in the data base, and the Kolmogorov-Smirnov deviation statistic (8). Variables 1-24 deal

TABLE II

Statistical listing of the flight response indices (variables 1-24) and laboratory test scores (variables 25-43) for the entire FRS study population. Separate listings are provided for the flight response indices received during basic (variables 1-6), advanced (variables 7-12), and FRS (variables 13-18) training as well as the mean (variables 19-24) of these indices. See text for additional details.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR	MIN	MAX	MEDIAN	N	DEV
1	BAS-AIRSICKNESS INDEX-UW	19.8	19.2	1.0	.0	100.0	16.7	353	.14#
2	BAS-AIRSICKNESS INDEX--W	9.7	10.2	.5	.0	60.0	6.7	353	.16#
3	BAS-VOMITING INDEX-UW	8.9	13.0	.7	.0	100.0	.0	353	.32#
4	BAS-VOMITING INDEX--W	4.0	7.9	.4	.0	50.0	.0	353	.32#
5	BAS-PERF.DEGRAD.INDEX-UW	12.3	15.3	.8	.0	100.0	6.7	353	.21#
6	BAS-PERF.DEGRAD.INDEX--W	6.0	8.0	.4	.0	60.0	3.3	353	.20#
7	ADV-AIRSICKNESS INDEX-UW	8.9	13.4	.8	.0	100.0	5.0	304	.24#
8	ADV-AIRSICKNESS INDEX--W	3.8	5.9	.3	.0	44.4	1.7	304	.22#
9	ADV-VOMITING INDEX-UW	3.3	8.4	.5	.0	66.7	.0	304	.38#
10	ADV-VOMITING INDEX--W	1.6	4.2	.2	.0	37.0	.0	304	.38#
11	ADV-PERF.DEGRAD.INDEX-UW	2.5	5.2	.3	.0	28.6	.0	304	.43#
12	ADV-PERF.DEGRAD.INDEX--W	1.0	2.2	.1	.0	14.6	.0	304	.43#
13	FRS-AIRSICKNESS INDEX-UW	11.8	18.7	1.0	.0	100.0	3.4	357	.22#
14	FRS-AIRSICKNESS INDEX--W	5.7	10.4	.6	.0	86.7	1.5	357	.25#
15	FRS-VOMITING INDEX-UW	4.3	12.1	.6	.0	100.0	.0	357	.38#
16	FRS-VOMITING INDEX--W	2.3	7.1	.4	.0	66.7	.0	357	.37#
17	FRS-PERF.DEGRAD.INDEX-UW	5.8	14.0	.7	.0	100.0	.0	357	.36#
18	FRS-PERF.DEGRAD.INDEX--W	2.5	6.4	.3	.0	55.6	.0	357	.32#
19	MEAN-AIRSICK INDICES-UW	13.0	12.8	.7	.0	60.9	10.3	357	.14#
20	MEAN-AIRSICK INDICES--W	6.6	6.0	.4	.0	40.1	4.5	357	.16#
21	MEAN-VOMITING INDICES-UW	5.6	8.6	.5	.0	49.6	1.2	357	.25#
22	MEAN-VOMITING INDICES--W	3.0	4.9	.3	.0	32.8	.4	357	.26#
23	MEAN-PER.DEGRAD.INDICES-UW	7.2	9.7	.5	.0	91.2	4.2	357	.20#
24	MEAN-PER.DEGRAD.INDICES--W	3.3	4.0	.3	.0	38.5	1.9	357	.22#
25	TMSQ1-MS HISTORY, PART 1	9.1	11.4	.7	.0	52.5	5.1	292	.17#
26	TMSQ2-MS HISTORY, PART 2	7.4	10.2	.6	.0	60.0	4.5	292	.20#
27	TMSQ3-MS HISTORY, SUM	16.4	19.4	1.1	.0	108.5	11.3	292	.20#
28	TSANX-STATE/ANX.QUEST.	31.1	8.5	.8	20.0	57.0	29.0	122	.13
29	TTANX-TRAIT/ANX.QUEST.	29.2	6.2	.6	20.0	49.0	28.5	122	.08
30	TBVDR-BVDT RATER	13.9	6.3	.4	6.0	30.3	11.7	293	.21#
31	TBVDS-BVDT SELF-RATING	14.3	6.6	.4	5.0	34.0	13.0	293	.11#
32	TBVDP-BVDT POST-RATING	5.4	12.7	.8	.0	90.0	1.0	281	.35#
33	TVVSP1-VVIT STATIC-RIGHT	122.3	8.0	.7	84.0	129.0	124.0	133	.20#
34	TVVSP2-VVIT STATIC-WRONG	4.7	5.4	.5	.0	22.0	3.0	133	.22#
35	TVVSP3-VVIT STATIC-OMIT	2.1	4.5	.4	.0	39.0	.0	133	.33#
36	TVVDP1-VVIT DYNAMIC-RIGHT	75.1	31.5	2.7	9.0	129.0	73.0	133	.08
37	TVVDP2-DYNAMIC-WRONG	9.1	6.5	.6	.0	36.0	8.0	133	.09
38	TVVDP3-VVIT DYNAMIC-OMIT	44.9	32.2	2.8	.0	120.0	45.0	133	.10
39	TVVIR-VVIT RATER	16.5	7.7	.7	7.0	50.5	14.5	133	.14#
40	TVVIS-VVIT SELF-RATING	15.7	6.9	.6	5.0	33.0	15.0	133	.11
41	TVVIP-POST-RATING	11.0	22.2	1.9	.0	180.0	4.0	133	.29#
42	SUM BVDT (30+31+32)	33.7	20.1	1.2	13.3	150.0	27.7	281	.19#
43	SUM VVIT (39+40+41)	43.2	30.1	2.6	13.0	214.0	35.0	133	.15#

# = SIGNIFICANT BEYOND THE .01 LEVEL UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

NOTE: The reader is cautioned not to assume that each variable listed above can be treated as an independent measure. For example, variables 1 through 24 are based upon observations in flight and some of these variables are highly intercorrelated; variables 25 through 43 are based upon laboratory test results and some of these variables are moderately intercorrelated. Refer to the correlation matrix presented in Table V for further details.

with the unweighted and weighted flight response indices calculated for each student according to his questionnaire responses, and variables 25-43 deal with the scores the students received on the laboratory motion-reactivity tests given prior to beginning NFO flight training. As emphasized earlier, the unweighted indices for a given student correspond directly to the percentage of flights flown by the students where the denoted responses occurred. The weighted indices reflect both the incidence and magnitude of the responses.

A key point in the interpretation of Table II is that all of the related data pertain to only those students who fully participated in the FRS phase of the longitudinal study. Although 372 students submitted questionnaires during FRS training, 15 students were not included in the Table II analysis since they did not meet the four-questionnaire minimum criterion for calculation of unweighted/weighted flight indices (See Procedure section). The performance of the 357 participating students during FRS training is represented by variables 13 through 18 ("FRS" prefix) in Table II. The performance of these students during their preceding training in basic and advanced squadrons is represented by variables 1 through 6 ("BAS" prefix) and variables 7 through 12 ("ADV" prefix), respectively. Variables 19 through 24 ("MEAN" prefix) are based upon the simple mean of the flight indices received by a given student during the basic, advanced, and FRS phases of his training.

The format for presentation of the test scores (variables 25 through 43) associated with individual performance on the motion reactivity test battery is essentially the same as that used in the previous reports (1-6). In brief, TMSQ1, TMSQ2, and TMSQ3 (variables 25 through 27) pertain to a motion sickness history where TMSQ1 and TMSQ2 involve motion sickness experiences prior to and following age 12, respectively, with TMSQ3 equal to the sum of the TMSQ1 and TMSQ2 scores; TSANX and TTANX (variables 28 and 29) to a state/trait anxiety test; TBVDR, TBVDS, and TBVDP (variable 30 through 32) to a Brief Vestibular Disorientation Test (BVDT) where SUM BVDT (variable 42) is the simple sum of the three BVDT scores; TVVSP1, TVVSP2, and TVVSP3 (variables 33 through 35) to the static performance element of a Visual/Vestibular Interaction Test (VVIT); TVVDP1, TVVDP2, and TVVDP3 (variables 36 through 38) to the dynamic performance element of the VVIT; and TVVIR, TVVIS, and TVVIP (variables 39 through 41) to the motion sickness element of the VVIT where SUM VVIT (variable 43) is the simple sum of these three VVIT scores. Details pertaining to these different test are presented in Appendix B.

In the interpretation of the numerical magnitude of the mean data presented in Table II and all following tables of similar format, it should be realized that for the 24 flight indices, high scores denote high susceptibility to airsickness and low scores low susceptibility. Correspondingly, for the majority of the motion reactivity test battery scores, high scores denote either poor performance or greater susceptibility to motion

stress. In the case of two test scores (TVVSP1 and TVVDP1), the converse is true in that these two variables pertain to the number of correct responses produced by the students while performing the related test tasks.

As with the questionnaire data collected previously (1-6), the distribution of the 24 flight indices are generally skewed toward the lower values of the response scale, with the median values of Table II consistently falling below the related means. The results of a Kolmogorov-Smirnov one-sample test of goodness of fit (8) of the normalized cumulative distribution of the observed data to an equivalent Gaussian distribution with the same mean and standard deviation as the observed data also indicate non-normality of the data. As indicated by the significance symbols adjacent to the Kolmogorov-Smirnov deviation statistic labeled as DEV in Table II, the null hypothesis that the distribution of the observed data is the same as a Gaussian distribution must be rejected at the .01 level or greater for all 24 of the flight indices. Similarly, the majority of the motion reactivity test scores display non-Gaussian distributions.

The unweighted flight indices shown in Table II for the FRS phase of training imply that the mean or "average" student experienced airsickness on 11.8 percent of the hops flown, vomited one or more times on 4.3 percent of the hops, and experienced inflight performance degradation due to airsickness on 5.8 percent of the hops. Corresponding figures for the advanced/secondary phase of training were 8.9, 3.3, and 2.5 percent respectively; and for the basic/primary phase, 19.8, 8.9, and 12.3 percent, respectively. In effect, though the "average" student experienced a drop in airsickness incidence following basic training as would be expected, the incidence remained approximately the same during the following advanced and FRS phases. However, as stressed in the previous reports (1-6), such "average student" interpretations of the Table II data are highly restricted by the non-Gaussian nature of the related distributions. Furthermore, though the Table II treatment of the entire FRS population as a single group is of advantage in describing overall performance, it does not identify significant differences in airsickness incidence that exist among different training pipelines as will be discussed in following sections.

AIRSICKNESS INDICES: INTRA-SQUADRON DIFFERENCES

Group statistics describing the flight indices and laboratory test scores for each FRS squadron included in the longitudinal study were also calculated using a format identical to that of Table II. The resulting data are summarized in Appendix A on an individual squadron basis. To establish if there were any statistically significant differences between the populations on an intra-squadron basis, a Kruskal-Wallis one-way analysis of variance by ranks test (8) was applied to the data associated with the individual squadrons. In effect, this test was applied to each group of FRS squadrons that involved the same

type-specific aircraft, e.g., one analysis compared student performance in the two F-14 squadrons, a second analysis compared student performance in the three F-4 squadrons, et cetera.

The results of these analysis indicated that there were no statistically significant differences (at the .01 level or better) in any of the flight indices received during basic, advanced, or FRS training for any of the intra-squadron groups. The same results were found for all of the laboratory motion reactivity test scores with the single exception of the motion sickness history sum score (variable 27) associated with the analysis of differences among the three A-6 squadrons. As indicated by the Appendix A tables associated with these squadrons, the mean scores for this variable were 8.8, 21.6, and 34.2 for FRS squadrons VA-42, VA-128, and MAG-14, respectively. For the entire FRS population (See Table II) the mean score for the same variable was 16.4.

AIRSICKNESS INDICES: PIPELINE DIFFERENCES

The same Kruskal-Wallis one-way analysis of variance statistical procedure was utilized to compare the performance of the NFO students across different pipelines as depicted by the four different advanced training blocks drawn in Figure 1. The results of this analysis are presented in Table III where the mean, standard deviation of the observations, standard error of the mean, and number of students are listed for each pipeline. The VT86-RIO pipeline heading includes all students who received FRS training in the two F-14 and three F-4 squadrons; the VT86-AJN heading includes those trained in the three A-6 squadrons and the single EA-6 and S-3 squadrons; the MAFB heading includes those trained in the two P-3 squadrons; and the ATDS heading those trained in the two E-2 squadrons. The Kruskal-Wallis $\underline{H}$-statistic corrected for tied scores is shown in the data column at the left in Table III. To disprove the null hypotnesis that the four student groups came from the same or identical population requires the $\underline{H}$-statistic to equal or exceed 11.34 at the .01 significance level or 16.27 at the .001 level, assuming that $\underline{H}$ is distributed like chi squared with three degrees of freedom. This applies to all of the response measures in Table III except for variables 7 through 12 which pertain to the flight indices received during advanced training. Since the students following the ATDS pipeline did not receive inflight training during this phase of training, only three degrees of freedom are associated with these variables and the $\underline{H}$-statistic must equal or exceed 9.21 and 13.82 to be statistically significant at the .01 or .001 levels, respectively.

As indicated by the significance symbols adjacent to the $\underline{H}$-statistic in Table III, the unweighted and weighted airsickness indices showed dissimilarities in the pipeline populations that were significant to the .001 level or better for all phases of training-basic, advanced, and FRS. For the vomiting indices, differences occurred in only the advanced phase of training. In

TABLE III

Results of a nonparametric Kruskal-Wallis one-way analysis of variance comparison (see text) of the flight and laboratory data derived from the four major NFO training pipelines. FRS training was received in F-4/F-14 aircraft for the VT86-RIO (fighter) pipeline; A-6/EA-6/S-3 aircraft for the VT86-AJN (attack) pipeline; P-3 aircraft for the MAFB pipeline; and E-2 aircraft for the ATDS pipeline.

RESPONSE VARIABLE NO.	DESCRIPTION	H STATISTIC	VT86-RIO PIPELINE MEAN	S.DEV.	S.ERR.	N	VT86-AJN PIPELINE MEAN	S.DEV.	S.ERR.	N	MAFB (P-3) PIPELINE MEAN	S.DEV.	S.ERR.	N	ATDS (E-2) PIPELINE MEAN	S.DEV.	S.ERR.	N
1	BAS-AIRSICKNESS INDEX-UW	24.20*	12.5	14.0	1.5	84	17.6	15.3	1.4	115	27.3	23.4	2.1	120	20.7	16.4	2.8	34
2	BAS-AIRSICKNESS INDEX--W	19.64*	6.0	7.2	.8	84	9.3	8.1	.8	115	13.4	12.7	1.2	120	10.6	8.9	1.5	34
3	BAS-VOMITING INDEX-UW	9.18	5.1	9.5	1.0	84	8.5	13.4	1.3	115	11.7	15.9	1.5	120	10.6	13.5	2.3	34
4	BAS-VOMITING INDEX--W	9.97	2.6	5.6	.6	84	4.1	6.3	.6	115	6.3	9.5	.9	120	6.9	10.5	1.8	34
5	BAS-PERF.DEGRAD.INDEX-UW	19.25*	6.9	9.5	1.0	84	9.9	10.7	1.0	115	17.2	19.3	1.8	120	16.3	18.3	3.1	34
6	BAS-PERF.DEGRAD.INDEX--W	16.40*	3.4	5.2	.6	84	4.8	5.8	.5	115	8.3	10.3	.9	120	7.9	8.6	1.5	34
7	ADV-AIRSICKNESS INDEX-UW	64.09*	15.3	18.4	2.0	84	10.0	11.8	1.1	112	2.6	5.5	.5	100	.0	.0	.0	0
8	ADV-AIRSICKNESS INDEX--W	63.90*	6.4	7.9	.9	84	4.4	5.6	.5	112	1.1	2.3	.2	100	.0	.0	.0	0
9	ADV-VOMITING INDEX-UW	43.68*	6.2	12.6	1.4	84	4.9	7.6	.7	112	.2	1.1	.1	100	.0	.0	.0	0
10	ADV-VOMITING INDEX--W	43.61*	3.0	6.2	.7	84	2.0	3.8	.4	112	.1	.6	.1	100	.0	.0	.0	0
11	ADV-PERF.DEGRAD.INDEX-UW	34.08*	3.8	6.2	.7	84	3.4	6.1	.6	112	.5	1.0	.2	100	.0	.0	.0	0
12	ADV-PERF.DEGRAD.INDEX--W	34.25*	1.6	2.4	.3	84	1.4	2.7	.3	112	.2	.9	.1	100	.0	.0	.0	0
13	FRS-AIRSICKNESS INDEX-UW	27.55*	7.2	17.2	1.9	84	12.4	19.7	1.8	115	16.4	19.2	1.7	124	7.6	10.0	1.7	34
14	FRS-AIRSICKNESS INDEX--W	26.51*	3.5	9.1	1.0	84	6.0	11.2	1.0	115	8.0	11.1	1.0	124	.1	4.5	.8	34
15	FRS-VOMITING INDEX-UW	13.84	3.2	10.0	1.1	84	6.0	15.1	1.4	115	4.6	11.0	1.1	124	.7	2.3	.4	34
16	FRS-VOMITING INDEX--W	14.09	1.6	5.6	.6	84	3.0	8.4	.8	115	2.7	7.5	.7	124	.2	.0	.1	34
17	FRS-PERF.DEGRAD.INDEX-UW	13.66	3.4	12.2	1.3	84	4.0	11.1	1.0	115	9.0	16.0	1.4	124	3.7	17.2	3.0	34
18	FRS-PERF.DEGRAD.INDEX--W	13.44	1.4	4.9	.5	84	1.9	4.1	.4	115	4.2	8.6	.0	124	1.3	5.0	1.0	34
19	MEAN-AIRSICK INDICES-UW	0.54	11.7	13.5	1.5	84	13.1	11.6	1.1	115	16.1	13.3	1.2	124	12.7	11.9	2.6	34
20	MEAN-AIRSICK INDICES--W	7.90	5.3	6.6	.7	84	6.2	6.5	.6	115	7.8	7.4	.7	124	6.3	5.9	1.0	34
21	MEAN-VOMITING INDICES-UW	2.31	4.8	8.6	.9	84	6.2	9.4	.9	115	5.6	9.2	.7	124	5.7	7.2	1.2	34
22	MEAN-VOMITING INDICES--W	2.52	2.4	4.6	.5	84	3.1	5.0	.5	115	3.1	4.9	.4	124	3.6	5.4	.9	34
23	MEAN-PER.DEGRAD.INDICES-UW	13.88*	4.7	7.4	.8	84	6.1	6.9	.6	115	9.2	10.6	1.0	124	10.0	16.1	2.8	34
24	MEAN-PER.DEGRAD.INDICES--W	12.91*	2.1	3.4	.4	84	2.7	3.4	.3	115	4.4	5.0	.5	124	4.6	6.4	1.1	34
25	TMSQ1-MS HISTORY: PART 1	2.69	8.1	10.9	1.3	65	8.2	10.9	1.1	99	10.7	12.5	1.2	105	8.0	10.2	2.1	23
26	TMSQ2-MS HISTORY: PART 2	6.26	5.6	8.1	1.0	65	6.0	10.2	1.0	99	9.2	11.3	1.1	105	6.7	8.0	1.0	23
27	TMSQ3-MS HISTORY: SUM	4.41	13.6	16.5	2.0	65	15.0	10.4	1.9	99	19.9	21.9	2.1	105	14.6	17.9	3.7	23
28	TSANX-STATE/ANX.QUEST.	1.41	29.9	8.7	1.7	27	30.0	7.2	1.3	33	32.0	9.4	1.3	53	30.1	7.6	2.5	9
29	TTANX-TRAIT/ANX.QUEST.	4.36	27.0	6.5	1.2	27	28.4	5.0	.9	33	30.1	6.0	.0	53	31.3	9.1	3.0	9
30	TBVDR-BVDT RATER	7.99	12.5	6.0	.7	65	14.4	6.6	.7	100	14.3	6.1	.6	105	13.3	6.4	1.3	23
31	TBVDS-BVDT SELF-RATING	0.03	12.2	5.5	.7	65	15.1	7.0	.7	100	14.0	6.6	.6	105	13.9	7.2	1.5	23
32	TBVDP-BVDT POST-RATING	7.31	4.5	13.2	1.7	60	5.6	13.2	1.3	90	6.1	13.1	1.3	101	4.1	5.0	1.2	22
33	TVVSP1-VVIT STATIC-RIGHT	5.53	124.3	6.4	1.2	30	122.6	7.5	1.2	30	121.0	0.0	1.2	55	120.0	9.0	2.9	10
34	TVVSP2-VVIT STATIC-WRONG	4.37	3.4	4.0	.9	30	4.7	6.1	1.0	30	5.1	4.9	.7	55	5.0	6.7	2.1	10
35	TVVSP3-VVIT STATIC-OMIT	4.03	1.3	2.6	.5	30	1.4	2.5	.4	30	2.9	6.2	.0	55	2.4	2.0	.9	10
36	TVVDP1-VVIT DYNAMIC-RIGHT	3.23	01.5	33.0	6.2	30	60.0	36.0	5.0	30	77.0	27.6	3.7	55	71.4	24.7	7.0	19
37	TVVDP2-DYNAMIC-WRONG	2.00	0.0	7.1	1.3	30	9.0	7.7	1.2	30	9.1	5.5	.7	55	9.4	5.4	1.7	10
38	TVVDP3-VVIT DYNAMIC-OMIT	1.01	39.5	32.0	6.0	30	51.2	36.5	5.9	30	42.9	29.4	4.0	55	40.2	27.0	0.5	10
39	TVVIR-VVIT RATER	.61	16.4	0.0	1.5	30	17.1	0.1	1.3	30	16.7	0.0	1.1	55	14.2	4.1	1.3	10
40	TVVIS-VVIT SELF-RATING	1.79	14.5	6.7	1.2	30	16.2	7.4	1.2	30	15.6	6.7	.9	55	17.6	7.6	2.4	10
41	TVVIP-POST-RATING	5.95	7.5	13.0	2.5	30	7.0	10.7	1.7	30	15.4	30.5	4.1	55	12.6	10.4	5.0	10
42	SUM BVDT (30+31+32)	7.46	20.7	17.0	2.3	60	35.1	20.7	2.1	90	35.6	21.6	2.1	101	31.9	15.5	3.3	22
43	SUM VVIT (39+40+41)	1.77	30.4	25.0	4.6	30	40.2	22.0	3.6	30	47.7	37.4	5.0	55	44.4	26.2	0.3	10

0 = SIGNIFICANT BEYOND THE .01 LEVEL UW = UNWEIGHTED RESPONSE INDEX
* = SIGNIFICANT BEYOND THE .001 LEVEL W = WEIGHTED RESPONSE INDEX

the case of the performance degradation indices, differences occurred during both basic and advanced training. With reference to the mean data (variable 19-24) of Table III, differences existed with only the performance degradation indices.

Prior to further discussion of the Table III data reference will again be made to Figure 1 to describe some fundamental differences in the flight syllabi and student flow associated with the four different advanced training pipelines at the time the longitudinal study was implemented. As schematized by the two blocks drawn within the VT10 block at the top in Figure 1, the flight syllabus in this squadron can be considered to be subdivided into two sequential phases. All students flew the first phase while only those students to be assigned to the VT86-AJN, VT86-RIO, and ATDS advanced training pipelines flew the second phase. The primary aircraft used in the first phase was the T-2 with both the T-2 and the T-39D in the second phase.

At the time the study was initiated, the VT10 flight syllabus consisted of five hops in the first phase and 13 hops in the second phase as denoted by the # symbol in Figure 1. Midway in the study, the VT10 flight syllabus was modified so as to provide eight hops in the first phase and 13 hops in the second phase as denoted by the * symbol. Changes in the number of hops comprising the flight syllabi associated with the VT86-AJN and VT86-RIO pipelines also occurred at about the same time while no changes occurred in the 17 hop MAFB flight syllabus. Both components of Squadron VT86 used the T-39D as the primary training aircraft with a few special hops flown in the TA-4J. The primary aircraft used in the MAFB squadron was the P-43A. As indicated in the ATDS block, advanced training in this pipeline was of academic nature and did not involve a stand-alone flight syllabus prior to FRS training.

Returning to the data of Table III, attention will be given first to differences that existed among the four pipelines during basic training. In general, the airsickness measures (variable 1-6) were highest in the MAFB pipeline. This is accounted for primarily because of the differences in motion stress that existed between the two sequential phases of the VT10 flight syllabus. In the first phase, two of the five hops in the old VT10 syllabus and four of the eight hops in the new syllabus involved a relatively high incidence of airsickness. In the second phase, only three of the thirteen hops in the old VT10 syllabus and three of twelve hops in the new syllabus produced a high incidence of airsickness. Since the students following the MAFB pipeline flew only the first phase, it would be expected that their flight indices would be higher than those of the students following the other pipelines who were required to fly both components of the VT10 syllabus.

In the case of the airsickness measures associated with advanced training (variables 6-12), the data of Table III are distinguished again by the MAFB pipeline which had the least

difficulties with airsickness. This would be expected since the MAFB flight syllabus involved training in the large, relatively stable P-43A with most hops involving straight and level flight. However, when the MAFB students reached the FRS phase of their training which involved long-duration missions in the P-3 aircraft, airsickness incidence rose considerably as reflected by the magnitude of variables 3 through 18 in Table III for this pipeline.

In aviation, it has always been a long-term objective to optimize the selection and assignment of personnel to closely match the performance capabilities of an individual to the performance requirements of given aircrew task or function. In the case of airsick susceptible individuals, it must be the objective to eliminate those students who do not gradually adapt to the flight motion environment early in the training program in order to minimize the high costs of attrition during the later phases of training. In this regard, attention should be given particularly to the students entering the MAFB pipeline. Since this group flies relatively few hops during basic training, and receives only a mild exposure to motion stress during advanced training, a test of airsickness susceptibility will not arrive until the FRS phase of training is reached. Since only a relatively few hops are flown in the P-3 squadrons during this phase compared to the fighter and attack aircraft pipelines, there is an additional hazard that such students may not be identified until they receive their initial fleet assignments.

RELATIVE AIRSICKNESS SUSCEPTIBILITY: NON-PARTICIPATING STUDENTS

As with any longitudinal study involving volunteer subjects, a certain number of students chose to drop out of the study following their graduation from Squadron VT10 even though they continued their NFO training in subsequent advanced and FRS squadrons. Data which allows the determination of the number of students who dropped out of the study at different points within each pipeline is provided in Figure 1 by the variable $\underline{N}$ with appropriate subscripts defined as follows. The variable N_p shown within or adjacent to a squadron block represents the number of students who participated in the airsickness study associated with the given squadron. A participating student in a given squadron was defined as one who submitted sufficient questionnaires to permit calculation of unweighted and weighted flight indices related to his airsickness performance within the given squadron. In like manner, the variable N_g represents the number of participating students who graduated from a given squadron. As shown for Squadron VT10 in Figure 1, 757 students participated in the study during this first phase of NFO training with 674 (89 percent) graduating and 83 (11 percent) attriting. The distribution of assignments to the four different advanced training pipelines for those graduating from VT10 was 191 (28.3 percent) students to MAFB; 242 (35.9 percent) to VT86-AJN; 202 (30.0 percent) to VT86-RIO; and only 39 (5.8 percent) to ATDS. Of these individual pipeline totals, 125 (65.4 percent) of the MAFB

students continued to participate in the airsickness study during advanced training; 215 (88.4 percent) of the VT86-AJN students and 180 (89.1 percent) of the VT86-RIO students.

During advanced training in VT86-AJN and VT86-RIO, 23 (10.7 percent) and 14 (7.8 percent), respectively, of the participating students attrited with the remaining receiving FRS assignments. No attrites were reported in the MAFB and ATDS squadrons. Of the 192 participating students who graduated from VT86-AJN, 115 (59.9 percent) continued to participate in the study during the FRS phase of their training (one of the 115 students was transferred to the fighter pipeline following graduation from VT86-AJN). For the VT86-RIO pipeline, 84 (50.6 percent) of the 166 graduating students participated during FRS training. Corresponding figures for the MAFB and ATDS pipelines were 124 (99.2 percent) and 34 (87.2 percent), respectively. In effect, of the total of 191 students who graduated from VT10 and were assigned to the MAFB pipeline, only 124 (65 percent of the total) students continued their voluntary participation through FRS training in the P-3 squadrons. Similarly, of the 242 VT10 students who followed the VT86-AJN pipeline, only 115 (47 percent) continued participation during FRS training; and for the 202 VT10 students who followed the VT86-RIO pipeline, only 84 (42 percent) continued through FRS training.

These data indicate that the number of student dropouts from this study ranged from 40 to 60 percent in the three principal pipelines following graduation from VT10. Since no flight data are available for these dropouts during the FRS phase of training, one cannot determine if the incidence of airsickness would have risen or fallen in these squadrons if these individuals had decided to continue their participation in the study. However, some insight can be gained into this determination by comparing certain elements of the Table III flight response data to corresponding data presented in the previous reports (1-6) of the longitudinal study.

For example, in two previous reports (1,4) dealing with student performance during basic training in VT10, data were presented (Table V) that compared the flight indices received by the students who graduated from VT10 and were assigned to the VT86-AJN pipeline with corresponding indices received by graduating students assigned to the VT86-RIO pipeline. When the student-based airsickness index data related to the old and new VT86-AJN flight syllabi are combined, a value of approximately 19.1 is obtained for the mean airsickness index received during basic training by the 242 student assigned to the VT86-AJN pipeline. However, reference to Variable 1 of Table III of this report indicates that for the 115 students who continued their participation through the FRS phase of training, the mean airsickness index was only 17.0 during basic training. This difference would imply that the VT86-AJN students who withdrew from the study had a slightly greater tendency toward airsickness

than those who continued their participation through the FRS phase.

For the VT86-RIO pipeline, corresponding calculations based upon combining the airsickness data produced by the students who flew the old (1) and new (4) VT10 flight syllabus indicate a mean airsickness index value of 16.4 during basic training for the participating students. As shown by variable 1 in Table III for the VT86-RIO pipeline, the same measure for the students who continued participation through FRS training had a value of only 12.5. The implication here again is that the airsickness susceptibility of the dropout students is slightly higher than those who continued their voluntary participation. In the case of the MAFB pipeline, following the same procedure as above, the students who participated initially in the study had an airsickness index value of 26.2 as compared to the corresponding value of 27.3 shown in Table III. In this case, little difference seems to exist between the dropout and participating populations.

In effect, although a considerable number of students chose to voluntarily discontinue their participation following basic training, it would appear that their withdrawal did not result in an overestimation of the magnitude of the airsickness problem during NFO training as documented in this and the preceding reports (1-6) of the longitudinal study.

COMPARISON OF AIRSICK/NONAIRSICK STUDENT PERFORMANCE ON LABORATORY TEST BATTERY

As stressed in the first report (1) of the series, a long-term objective of this laboratory is to develop and validate an airsickness test battery to identify both susceptible and nonsusceptible aviation candidates. It has been the concept of this project that the relative effectiveness of any prototype test undergoing development to measure individual sensitivity to a given motion environment will be best validated by actual exposure of the tested subjects to the environment of concern. The flight data presented in this report, particularly the "mean" flight indices (variables 19 through 24), serve such a validation function in that students who rarily experienced airsickness during NFO flight training (low flight index scores) can be readily distinguished from those who repeatedly suffered airsickness (high flight index scores). Accordingly, separation of the students into susceptible and nonsusceptible groups based upon their actual flight performance provides direct insight into the relative merit of the individual components of the prototype motion reactivity test battery (variables 25 through 43) given to a large proportion of the NFO study populations.

The data of Table IV provides such a comparison between susceptible and nonsusceptible airsickness populations based upon a Kruskal-Wallis one-way analysis of variance. The nonairsick population was defined as those students who reported they never experienced airsickness at any time during their basic, advanced,

TABLE IV

Results of a Kruskal-Wallis one-way analysis of variance comparison of students who reported never experiencing airsickness during NFO training with students who had a relatively high incidence of airsickness. The airsick group, arbitrarily established as the most sensitive 10 percent of the students, was defined as those students with a mean unweighted airsickness index (variable 19) equal to or greater than 31.9 which marked the upper decile for this measure.

RESPONSE VARIABLE NO.	DESCRIPTION	H STATISTIC	NON-AIRSICK MEAN	S.DEV.	S.ERR.	N	AIRSICK MEAN	S.DEV.	S.ERR.	N
1	BAS-AIRSICKNESS INDEX-UW	75.67*	.0	.0	.0	52	46.3	22.2	3.8	35
2	BAS-AIRSICKNESS INDEX--W	75.66*	.0	.0	.0	52	24.1	12.7	2.2	35
3	BAS-VOMITING INDEX-UW	57.72*	.0	.0	.0	52	24.7	21.3	3.6	35
4	BAS-VOMITING INDEX--W	57.71*	.0	.0	.0	52	13.9	12.4	2.1	35
5	BAS-PERF.DEGRAD.INDEX-UW	63.44*	.0	.0	.0	52	32.8	24.8	4.1	35
6	BAS-PERF.DEGRAD.INDEX--W	63.42*	.0	.0	.0	52	16.8	12.8	2.2	35
7	ADV-AIRSICKNESS INDEX-UW	47.41*	.0	.0	.0	41	29.8	25.9	5.2	25
8	ADV-AIRSICKNESS INDEX--W	47.41*	.0	.0	.0	41	12.6	11.2	2.2	25
9	ADV-VOMITING INDEX-UW	28.17*	.0	.0	.0	41	15.8	19.2	3.8	25
10	ADV-VOMITING INDEX--W	28.17*	.0	.0	.0	41	7.7	9.5	1.9	25
11	ADV-PERF.DEGRAD.INDEX-UW	30.68*	.0	.0	.0	41	7.3	8.8	1.8	25
12	ADV-PERF.DEGRAD.INDEX--W	30.68*	.0	.0	.0	41	2.7	3.1	.6	25
13	FRS-AIRSICKNESS INDEX-UW	75.67*	.0	.0	.0	52	47.8	30.6	5.2	35
14	FRS-AIRSICKNESS INDEX--W	75.66*	.0	.0	.0	52	23.9	19.9	3.4	35
15	FRS-VOMITING INDEX-UW	44.52*	.0	.0	.0	52	23.8	27.1	4.6	35
16	FRS-VOMITING INDEX--W	44.51*	.0	.0	.0	52	12.8	16.4	2.8	35
17	FRS-PERF.DEGRAD.INDEX-UW	57.72*	.0	.0	.0	52	27.8	31.3	5.3	35
18	FRS-PERF.DEGRAD.INDEX--W	57.71*	.0	.0	.0	52	11.8	14.5	2.5	35
19	MEAN-AIRSICK INDICES-UW	78.89*	.0	.0	.0	52	41.8	8.1	1.4	35
20	MEAN-AIRSICK INDICES--W	78.89*	.0	.0	.0	52	20.7	7.3	1.2	35
21	MEAN-VOMITING INDICES-UW	60.53*	.0	.0	.0	52	20.8	13.8	2.2	35
22	MEAN-VOMITING INDICES--W	60.53*	.0	.0	.0	52	11.4	8.8	1.4	35
23	MEAN-PER.DEGRAD.INDICES-UW	75.65*	.0	.0	.0	52	24.2	17.9	3.8	35
24	MEAN-PER.DEGRAD.INDICES--W	75.65*	.0	.0	.0	52	11.8	8.8	1.5	35
25	TMSQ1-MS HISTORY, PART 1	19.84*	2.8	5.7	.9	45	18.8	17.8	3.5	26
26	TMSQ2-MS HISTORY, PART 2	31.43*	2.1	4.9	.7	45	20.8	17.8	3.5	26
27	TMSQ3-MS HISTORY, SUM	34.16*	4.9	9.8	1.5	45	38.8	32.5	6.4	26
28	TSANX-STATE/ANX.QUEST.	9.818	26.8	8.5	2.1	16	35.8	9.3	2.6	13
29	TTANX-TRAIT/ANX.QUEST.	1.36	27.9	7.4	1.3	16	29.9	3.4	1.8	13
30	TBVDR-BVDT RATER	17.49*	11.4	5.1	.8	45	17.3	8.8	1.6	26
31	TBVDS-BVDT SELF-RATING	26.68*	10.1	4.9	.7	45	20.2	7.2	1.4	26
32	TBVDP-BVDT POST-RATING	20.20*	1.4	3.8	.6	44	20.5	27.1	5.5	24
33	TVVSP1-VVIT STATIC-RIGHT	2.34	117.2	11.9	2.8	18	122.9	7.8	1.8	15
34	TVVSP2-VVIT STATIC-WRONG	2.81	7.9	6.7	1.6	18	4.7	5.2	1.4	15
35	TVVSP3-VVIT STATIC-OMIT	.62	3.9	9.1	2.1	18	1.4	2.2	.6	15
36	TVVDP1-VVIT DYNAMIC-RIGHT	1.84	81.8	27.1	6.4	18	67.3	28.8	7.2	15
37	TVVDP2-DYNAMIC-WRONG	3.41	10.9	5.5	1.3	18	8.1	7.4	1.9	15
38	TVVDP3-VVIT DYNAMIC-OMIT	1.99	36.3	28.2	6.6	18	53.6	31.8	8.8	15
39	TVVIR-VVIT RATER	3.26	12.8	4.8	.9	18	19.8	12.8	3.1	15
40	TVVIS-VVIT SELF-RATING	8.118	11.4	6.8	1.6	18	19.7	8.3	2.1	15
41	TVVIP-POST-RATING	9.418	5.2	13.9	3.3	18	16.6	27.4	7.1	15
42	SUM BVDT (30+31+32)	20.52*	22.8	18.8	1.6	44	58.5	35.4	7.2	24
43	SUM VVIT (39+40+41)	8.388	20.6	21.4	5.8	18	55.3	48.1	18.3	15

S = STUDENT RESPONSE DATA
I = INSTRUCTOR RESPONSE DATA
8 = SIGNIFICANT BEYOND THE .01 LEVEL
* = SIGNIFICANT BEYOND THE .001 LEVEL

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

and FRS training, thus resulting in a mean unweighted airsickness index (variable 19) of 0.0. Of the total of 357 students who participated throughout the NFO training program, 52 (14.6 percent) reported never being airsick on an NFO training hop. The susceptible or airsick population was defined as those ten percent of the total student population who had a mean unweighted airsickness index (variable 19) that equaled or exceeded the 90th centile (upper decile) established by the normalized cumulative frequency distribution of this particular index based upon the total population of 357 students. The frequency distribution data indicated that a value of 31.9 defined the upper decile for variable 19. In effect, the airsick population in Table IV represents that ten percent (35 students) of the population found to experience the greatest incidence of airsickness.

An inspection of the significance symbols shown adjacent to the H-statistic in Table IV, shows that all of the flight indices (variables 1 through 24) were significantly different for the two populations which follows, by definition, as a result of the airsick/nonairsick selection criteria. As indicated by the unweighted airsickness index data of this table the "average" airsick susceptible student experienced airsickness on approximately 46 percent of his basic training hops, 29 percent of his advanced training hops, and 47 percent of his FRS hops.

In the case of the laboratory test data presented in Table IV, the three components of the motion sickness case history evaluation (variables 25-27), the three components of the BVDT (variables 30-32), and the BVDT sum (variable 42), served to significantly distinguish between the airsick and nonairsick populations at the .001 level or better. In addition, the state/anxiety test (variable 28), the self-rating and post-rating elements of the VVIT (variables 40-41), and the VVIT sum score identified population differences significant to the .01 level or better. These findings follow, in general, those reported previously with the motion sickness case history and BVDT test scores showing the greatest potential for further development as candidate selection criteria.

CORRELATION MATRICES: FLIGHT/LABORATORY DATA

To gain further insight into the relationships that exist among the flight airsickness indices and the laboratory test scores for the 357 students who participated in the study through the FRS phase, a Spearman rank correlation analysis corrected for tied scores was performed on the group data. The results of this analysis are presented in matrix form in Table V with the total number of data pairs associated with a given correlation coefficient within this matrix similarly tabulated in Table VI. The statistical significance of the rank correlation coefficients was determined by calculation of a t statistic for each relationship and a standard two-tailed student t-test evaluation performed. Those correlations found to be statistically

NO.	RESPONSE VARIABLE DESCRIPTION	1	2	3	4	5	6	7	8
1	BAS-AIRSICKNESS INDEX-UW	1.00							
2	BAS-AIRSICKNESS INDEX--W	.97*1.00							
3	BAS-VOMITING INDEX-UW	.72*	.75*1.00						
4	BAS-VOMITING INDEX--W	.72*	.75*	.99*1.00					
5	BAS-PERF.DEGRAD.INDEX-UW	.76*	.79*	.69*	.70*1.00				
6	BAS-PERF.DEGRAD.INDEX--W	.76*	.81*	.71*	.72*	.98*1.00			
7	ADV-AIRSICKNESS INDEX-UW	.24*	.28*	.28*	.29*	.21*	.24*1.00		
8	ADV-AIRSICKNESS INDEX--W	.26*	.29*	.30*	.30*	.23*	.26*	.99*1.00	
9	ADV-VOMITING INDEX-UW	.26*	.28*	.38*	.37*	.22*	.24*	.63*	.67*1.
10	ADV-VOMITING INDEX--W	.26*	.28*	.38*	.38*	.23*	.25*	.63*	.67*1.
11	ADV-PERF.DEGRAD.INDEX-UW	.23*	.26*	.28*	.28*	.24*	.28*	.67*	.70*
12	ADV-PERF.DEGRAD.INDEX--W	.23*	.26*	.29*	.29*	.25*	.28*	.66*	.70*
13	FRS-AIRSICKNESS INDEX-UW	.48*	.49*	.37*	.37*	.41*	.44*	.23*	.23*
14	FRS-AIRSICKNESS INDEX--W	.49*	.50*	.39*	.39*	.43*	.45*	.23*	.23*
15	FRS-VOMITING INDEX-UW	.39*	.40*	.47*	.47*	.38*	.39*	.37*	.39*
16	FRS-VOMITING INDEX--W	.38*	.39*	.47*	.47*	.37*	.39*	.37*	.39*
17	FRS-PERF.DEGRAD.INDEX-UW	.39*	.40*	.24*	.25*	.34*	.36*	.20*	.21*
18	FRS-PERF.DEGRAD.INDEX--W	.39*	.40*	.25*	.25*	.34*	.36*	.20*	.21*
19	MEAN-AIRSICK INDICES-UW	.87*	.86*	.66*	.66*	.68*	.70*	.49*	.50*
20	MEAN-AIRSICK INDICES--W	.87*	.89*	.69*	.70*	.73*	.75*	.48*	.49*
21	MEAN-VOMITING INDICES-UW	.67*	.70*	.90*	.90*	.65*	.68*	.44*	.47*
22	MEAN-VOMITING INDICES--W	.67*	.70*	.90*	.90*	.66*	.69*	.44*	.47*
23	MEAN-PER.DEGRAD.INDICES-UW	.77*	.80*	.65*	.65*	.90*	.90*	.33*	.35*
24	MEAN-PER.DEGRAD.INDICES--W	.76*	.81*	.66*	.67*	.89*	.92*	.34*	.36*
25	TMSQ1-MS HISTORY: PART 1	.41*	.40*	.33*	.34*	.35*	.34*	.19#	.19#
26	TMSQ2-MS HISTORY: PART 2	.47*	.45*	.37*	.38*	.33*	.32*	.20*	.20*
27	TMSQ3-MS HISTORY: SUM	.48*	.47*	.40*	.40*	.38*	.37*	.23*	.24*
28	TSANX-STATE/ANX.QUEST.	.34*	.36*	.28#	.28#	.34*	.33*	.23	.23
29	TTANX-TRAIT/ANX.QUEST.	.27#	.24#	.02	.01	.20	.19	.10	.08 -.
30	TBVDR-BVDT RATER	.37*	.37*	.36*	.35*	.34*	.34*	.16	.18#
31	TBVDS-BVDT SELF-RATING	.37*	.39*	.27*	.27*	.34*	.35*	.20*	.21*
32	TBVDP-BVDT POST-RATING	.28*	.27*	.16#	.16#	.27*	.26*	.14	.15
33	TVVSP1-VVIT STATIC-RIGHT	-.01	.01	-.07	-.06	-.03	-.02	.25#	.26#
34	TVVSP2-VVIT STATIC-WRONG	-.02	-.06	.04	.04	-.01	-.01	-.24	-.25#-
35	TVVSP3-VVIT STATIC-OMIT	.06	.06	.04	.04	.08	.07	-.15	-.14
36	TVVDP1-VVIT DYNAMIC-RIGHT	-.01	-.03	-.13	-.12	-.16	-.14	-.11	-.12
37	TVVDP2-DYNAMIC-WRONG	.02	-.01	.00	.02	-.01	-.01	-.20	-.20
38	TVVDP3-VVIT DYNAMIC-OMIT	.01	.03	.12	.11	.16	.14	.12	.13
39	TVVIR-VVIT RATER	.22#	.22#	.25#	.23#	.24#	.22#	.12	.13
40	TVVIS-VVIT SELF-RATING	.23#	.25#	.23#	.23#	.25#	.24#	.23	.25#
41	TVVIP-POST-RATING	.22	.21	.18	.18	.24#	.20	.05	.05
42	SUM BVD: (30+31+32)	.42*	.43*	.33*	.33*	.42*	.42*	.26*	.27*
43	SUM VVIT (39+40+41)	.27#	.27#	.25#	.25#	.27#	.25#	.15	.16

= SIGNIFICANT BEYOND THE .01 LEVEL UW = UNWEIGHTED RESPONSE INDEX
* = SIGNIFICANT BEYOND THE .001 LEVEL W = WEIGHTED RESPONSE INDEX

TABLE V

Correlation matrix for the FRS study population based upon the Spearman rank correlation coefficient corre

												RESPONSE	VARIABLE					
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
9*	1.00																	
3*	.67*	1.00																
3*	.67*	1.00*	1.00															
7*	.70*	.65*	.66*	1.00														
6*	.70*	.66*	.66*	1.00*	1.00													
3*	.23*	.16#	.16#	.19*	.19*	1.00												
3*	.23*	.17#	.17#	.20*	.21*	.99*	1.00											
7*	.39*	.40*	.40*	.40*	.40*	.56*	.60*	1.00										
7*	.39*	.40*	.39*	.40*	.40*	.56*	.60*	1.00*	1.00									
0*	.21*	.15#	.15#	.22*	.22*	.70*	.72*	.50*	.50*	1.00								
0*	.21*	.16#	.16#	.22*	.23*	.69*	.72*	.51*	.52*	1.00*	1.00							
9*	.50*	.39*	.39*	.39*	.39*	.75*	.74*	.51*	.51*	.55*	.55*	1.00						
0*	.49*	.39*	.40*	.40*	.40*	.72*	.73*	.53*	.52*	.55*	.55*	.98*	1.00					
4*	.47*	.59*	.59*	.45*	.45*	.42*	.45*	.66*	.66*	.32*	.33*	.70*	.73*	1.00				
4*	.47*	.58*	.58*	.45*	.46*	.42*	.44*	.65*	.65*	.33*	.34*	.69*	.73*	.99*	1.00			
3*	.35*	.32*	.33*	.43*	.44*	.58*	.59*	.47*	.47*	.60*	.60*	.80*	.83*	.68*	.69*	1.00		
4*	.36*	.32*	.33*	.44*	.45*	.57*	.59*	.47*	.47*	.59*	.59*	.79*	.84*	.69*	.70*	.98*	1.00	
19#	.19#	.17#	.17#	.11	.11	.26*	.26*	.25*	.24*	.15	.15	.40#	.39#	.34#	.33#	.34*	.34*	1.00
0*	.20*	.20*	.21*	.22*	.21*	.36*	.35*	.30*	.30*	.28*	.28*	.48*	.46*	.36*	.35*	.40*	.39*	.54*
3*	.24*	.22*	.22*	.18#	.18#	.36*	.36*	.32*	.31*	.25*	.25*	.50*	.49*	.40*	.40*	.42*	.41*	.87*
3	.23	.26#	.27#	.29#	.28#	.28#	.28#	.28#	.28#	.21	.22	.39*	.39*	.32*	.32*	.39*	.39*	.19
0	.08	-.04	-.05	.04	.04	.11	.11	.01	.01	.05	.05	.20	.19	.02	.02	.19	.17	.21
6	.18#	.20#	.20#	.13	.14	.26*	.25*	.16#	.16#	.16#	.17#	.38*	.38*	.34*	.34*	.33*	.34*	.18#
0*	.21*	.25*	.25*	.14	.14	.32*	.32*	.22*	.21*	.24*	.24*	.41*	.41*	.28*	.28*	.35*	.35*	.25*
4	.15	.12	.12	.12	.12	.25*	.23*	.08	.08	.18#	.18#	.31*	.31*	.18#	.18#	.32*	.30*	.31*
25#	.26#	.10	.09	.21	.21	.04	.04	-.02	-.02	.00	.00	.05	.04	-.05	-.05	.00	.00	-.06
4	-.25#	-.09	-.09	-.22	-.22	-.04	-.04	.02	.02	-.03	-.03	-.07	-.08	.03	.03	-.04	-.04	.06
5	-.14	-.10	-.15	-.16	-.15	-.02	-.02	-.01	-.01	.02	.02	.00	.02	.01	.01	.04	.04	.05
1	-.12	.01	.02	-.12	-.12	-.00	-.01	-.14	-.14	.04	.03	-.02	-.05	-.16	-.15	-.13	-.11	-.07
0	-.20	-.10	-.09	-.06	-.05	-.13	-.14	-.09	-.09	-.16	-.16	-.09	-.09	-.04	-.01	-.09	-.00	-.15
2	.13	.00	-.00	.11	.11	.04	.04	.14	.13	-.02	-.01	.04	.07	.15	.14	.14	.12	.11
2	.13	.14	.12	.15	.13	.14	.16	.23#	.23#	.13	.13	.23#	.24#	.30*	.27#	.25#	.24#	.27
3	.25#	.22	.21	.23	.22	.28#	.29*	.25#	.25#	.26#	.26#	.30*	.32*	.30*	.28*	.28*	.29*	.26
5	.05	.06	.05	.01	.00	.21	.20	.10	.10	.14	.13	.24#	.23#	.22	.20	.25#	.23#	.23
6*	.27*	.27*	.27*	.17#	.17#	.33*	.33*	.19#	.19#	.24*	.24*	.46*	.47*	.35*	.35*	.43*	.43*	.33
5	.16	.15	.13	.12	.11	.21	.22#	.21	.21	.16	.16	.29*	.29*	.31*	.28*	.27#	.26#	.27

INDEX
INDEX

tion coefficient corrected for tied scores.

E																		
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
00																		
69*1.00																		
70* .98*1.00																		
33# .34* .34*1.00																		
35* .40* .39* .54*1.00																		
40* .42* .41* .87* .85*1.00																		
32* .39* .39* .19 .26# .27#1.00																		
02 .19 .17 .21 .16 .22 .43*1.00																		
34* .33* .34* .18# .13 .18# .54* .13 1.00																		
28* .35* .35* .25* .23* .29* .62* .26# .59*1.00																		
18# .32* .38* .31* .29* .35* .58* .26# .39* .56*1.00																		
05 .00 .00 -.06 -.17 -.10 .17 -.06 .04 .17 .10 1.00																		
03 -.04 -.04 .06 .15 .09 -.16 .04 -.03 -.13 -.09 -.93*1.00																		
01 .04 .04 .05 .13 .00 -.00 .13 -.02 -.10 -.04 -.72* .46*1.00																		
15 -.13 -.11 -.07 .09 .02 -.20 -.13 -.34*-.17 -.21 .22#-.18 -.24#1.00																		
01 -.09 -.00 -.15 -.09 -.16 -.07 -.04 -.06 -.13 -.09 -.25# .27# .12 .01 1.00																		
14 .14 .12 .11 -.06 .02 .21 .13 .35* .10 .23#-.17 .12 .23#-.98*-.18 1.00																		
27# .25# .24# .27# .14 .23# .27# .07 .38* .20 .32*-.01 -.03 .07 -.43*-.21 .47*1.00																		
28* .28* .29* .26# .25# .31* .37* .22 .33* .41* .39* .07 -.12 .02 -.31*-.22# .34* .68*1.00																		
20 .25# .23# .23# .27# .29# .33* .23 .27# .22# .42*-.05 .00 .11 -.23#-.10 .26# .66* .71*																		
35* .43* .43* .33* .28* .36* .68* .25# .72* .90* .73* .12 -.00 -.09 -.22 -.13 .25# .38* .47*																		
28* .27# .26# .27# .26# .31* .34* .21 .34* .29* .40*-.01 -.05 .00 -.35*-.17 .38* .84* .89*																		

1 3

tied scores.

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
.00																
.27#	1.00															
.22	.43*	1.00														
.18#	.54*	.13	1.00													
.29*	.62*	.26#	.58*	1.00												
.35*	.58*	.26#	.39*	.56*	1.00											
.10	.17	-.06	.04	.17	.10	1.00										
.09	-.16	.04	-.03	-.13	-.09	-.93*	1.00									
.00	-.00	.13	-.02	-.10	-.04	-.72*	.46*	1.00								
.02	-.20	-.13	-.34*	-.17	-.21	.22#	-.18	-.24#	1.00							
.16	-.07	-.04	-.06	-.13	-.09	-.25#	.27#	.12	.01	1.00						
.02	.21	.13	.35*	.10	.23#	-.17	.12	.23#	-.98*	-.18	1.00					
.23#	.27#	.07	.38*	.20	.32*	-.01	-.03	.07	-.43*	-.21	.47*	1.00				
.31*	.37*	.22	.33*	.41*	.39*	.07	-.13	.02	-.31*	-.22#	.34*	.68*	1.00			
.29#	.33*	.23	.27#	.22#	.42*	-.05	.00	.11	-.23#	-.10	.26#	.66*	.71*	1.00		
.36*	.68*	.25#	.72*	.90*	.73*	.12	-.00	-.09	-.22	-.13	.25#	.38*	.47*	.37*	1.00	
.31*	.34*	.21	.34*	.29*	.40*	-.01	-.05	.00	-.35*	-.17	.38*	.84*	.89*	.89*	.44*	1.00

NO.	RESPONSE VARIABLE DESCRIPTION	1	2	3	4	5	6	7	8	9	10
1	BAS-AIRSICKNESS INDEX-UW	353									
2	BAS-AIRSICKNESS INDEX--W	353	353								
3	BAS-VOMITING INDEX-UW	353	353	353							
4	BAS-VOMITING INDEX--W	353	353	353	353						
5	BAS-PERF.DEGRAD.INDEX-UW	353	353	353	353	353					
6	BAS-PERF.DEGRAD.INDEX--W	353	353	353	353	353	353				
7	ADV-AIRSICKNESS INDEX-UW	300	300	300	300	300	300	304			
8	ADV-AIRSICKNESS INDEX--W	300	300	300	300	300	300	304	304		
9	ADV-VOMITING INDEX-UW	300	300	300	300	300	300	304	304	304	
10	ADV-VOMITING INDEX--W	300	300	300	300	300	300	304	304	304	304
11	ADV-PERF.DEGRAD.INDEX-UW	300	300	300	300	300	300	304	304	304	304
12	ADV-PERF.DEGRAD.INDEX--W	300	300	300	300	300	300	304	304	304	304
13	FRS-AIRSICKNESS INDEX-UW	353	353	353	353	353	353	304	304	304	304
14	FRS-AIRSICKNESS INDEX--W	353	353	353	353	353	353	304	304	304	304
15	FRS-VOMITING INDEX-UW	353	353	353	353	353	353	304	304	304	304
16	FRS-VOMITING INDEX--W	353	353	353	353	353	353	304	304	304	304
17	FRS-PERF.DEGRAD.INDEX-UW	353	353	353	353	353	353	304	304	304	304
18	FRS-PERF.DEGRAD.INDEX--W	353	353	353	353	353	353	304	304	304	304
19	MEAN-AIRSICK INDICES-UW	353	353	353	353	353	353	304	304	304	304
20	MEAN-AIRSICK INDICES--W	353	353	353	353	353	353	304	304	304	304
21	MEAN-VOMITING INDICES-UW	353	353	353	353	353	353	304	304	304	304
22	MEAN-VOMITING INDICES--W	353	353	353	353	353	353	304	304	304	304
23	MEAN-PER.DEGRAD.INDICES-UW	353	353	353	353	353	353	304	304	304	304
24	MEAN-PER.DEGRAD.INDICES--W	353	353	353	353	353	353	304	304	304	304
25	TMSQ1-MS HISTORY: PART 1	289	289	289	289	289	289	254	254	254	254
26	TMSQ2-MS HISTORY: PART 2	289	289	289	289	289	289	254	254	254	254
27	TMSQ3-MS HISTORY: SUM	289	289	289	289	289	289	254	254	254	254
28	TSANX-STATE/ANX.QUEST.	122	122	122	122	122	122	101	101	101	101
29	TTANX-TRAIT/ANX.QUEST.	122	122	122	122	122	122	101	101	101	101
30	TBVDR-BVDT RATER	290	290	290	290	290	290	255	255	255	255
31	TBVDS-BVDT SELF-RATING	290	290	290	290	290	290	255	255	255	255
32	TBVDP-BVDT POST-RATING	278	278	278	278	278	278	245	245	245	245
33	TVVSP1-VVIT STATIC-RIGHT	133	133	133	133	133	133	110	110	110	110
34	TVVSP2-VVIT STATIC-WRONG	133	133	133	133	133	133	110	110	110	110
35	TVVSP3-VVIT STATIC-OMIT	133	133	133	133	133	133	110	110	110	110
36	TVVDP1-VVIT DYNAMIC-RIGHT	133	133	133	133	133	133	110	110	110	110
37	TVVDP2-DYNAMIC-WRONG	133	133	133	133	133	133	110	110	110	110
38	TVVDP3-VVIT DYNAMIC-OMIT	133	133	133	133	133	133	110	110	110	110
39	TVVIR-VVIT RATER	133	133	133	133	133	133	110	110	110	110
40	TVVIS-VVIT SELF-RATING	133	133	133	133	133	133	110	110	110	110
41	TVVIP-POST-RATING	133	133	133	133	133	133	110	110	110	110
42	SUM BVDT (30+31+32)	278	278	278	278	278	278	245	245	245	245
43	SUM VVIT (39+40+41)	133	133	133	133	133	133	110	110	110	110

\# = SIGNIFICANT BEYOND THE .01 LEVEL UW = UNWEIGHTED RESPONSE INDEX
* = SIGNIFICANT BEYOND THE .001 LEVEL W = WEIGHTED RESPONSE INDEX

TABLE VI

Matrix indicating the number of data-pairs used in the calculation of the Table V Spearman rank correlat

RESPONSE VARIABLE

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
304																	
304	304																
304	304	304															
304	304	304	304														
304	304	304	304	304													
304	304	304	304	304	357												
304	304	304	304	304	357	357											
304	304	304	304	304	357	357	357										
304	304	304	304	304	357	357	357	357									
304	304	304	304	304	357	357	357	357	357								
304	304	304	304	304	357	357	357	357	357	357							
304	304	304	304	304	357	357	357	357	357	357	357						
304	304	304	304	304	357	357	357	357	357	357	357	357					
304	304	304	304	304	357	357	357	357	357	357	357	357	357				
304	304	304	304	304	357	357	357	357	357	357	357	357	357	357			
304	304	304	304	304	357	357	357	357	357	357	357	357	357	357	357		
304	304	304	304	304	357	357	357	357	357	357	357	357	357	357	357	357	
254	254	254	254	254	292	292	292	292	292	292	292	292	292	292	292	292	292
254	254	254	254	254	292	292	292	292	292	292	292	292	292	292	292	292	292
254	254	254	254	254	292	292	292	292	292	292	292	292	292	292	292	292	292
101	101	101	101	101	122	122	122	122	122	122	122	122	122	122	122	122	122
101	101	101	101	101	122	122	122	122	122	122	122	122	122	122	122	122	122
255	255	255	255	255	293	293	293	293	293	293	293	293	293	293	293	293	292
255	255	255	255	255	293	293	293	293	293	293	293	293	293	293	293	293	292
245	245	245	245	245	281	281	281	281	281	281	281	281	281	281	281	281	280
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132
245	245	245	245	245	281	281	281	281	281	281	281	281	281	281	281	281	280
110	110	110	110	110	133	133	133	133	133	133	133	133	133	133	133	133	132

INDEX
DEX

man rank correlation coefficients.

23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
57																		
57	357																	
92	292	292																
92	292	292	292															
92	292	292	292	292														
22	122	122	122	122	122													
22	122	122	122	122	122	122												
93	293	292	292	292	122	122	293											
93	293	292	292	292	122	122	293	293										
81	281	280	280	280	115	115	281	281	281									
33	133	132	132	132	122	122	132	132	124	133								
33	133	132	132	132	122	122	132	132	124	133	133							
33	133	132	132	132	122	122	132	132	124	133	133	133						
33	133	132	132	132	122	122	132	132	124	133	133	133	133					
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133				
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133	133			
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133	133	133		
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133	133	133	133	
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133	133	133	133	133
81	281	280	280	280	115	115	281	281	281	124	124	124	124	124	124	124	124	124
33	133	132	132	132	122	122	132	132	124	133	133	133	133	133	133	133	133	133

coefficients.

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
292																
122	122															
122	122	122														
292	122	122	293													
292	122	122	293	293												
280	115	115	281	281	281											
132	122	122	132	132	124	133										
132	122	122	132	132	124	133	133									
132	122	122	132	132	124	133	133	133								
132	122	122	132	132	124	133	133	133	133							
132	122	122	132	132	124	133	133	133	133	133						
132	122	122	132	132	124	133	133	133	133	133	133					
132	122	122	132	132	124	133	133	133	133	133	133	133				
132	122	122	132	132	124	133	133	133	133	133	133	133	133			
132	122	122	132	132	124	133	133	133	133	133	133	133	133	133		
280	115	115	281	281	281	124	124	124	124	124	124	124	124	124	281	
132	122	122	132	132	124	133	133	133	133	133	133	133	133	133	124	133

significant at the .01 and .001 levels or greater are identified accordingly in Table V. As with the previous reports in the longitudinal study the definitions of Guilford (ref 7, p. 145), as listed below, have been selected to facilitate the general interpretation of the relative strength of relationship described by the magnitude of a given correlation coeficient.

Less than .20	Slight; almost negligible relationship
.20 - .40	Low correlation; definite but small relationship
.40 - .70	Moderate correlation; substantial relationship
.70 - .90	High correlations; marked relationship
.90 -1.00	Very high correlations; very dependable relationship

Considering for the moment only the flight indices (variables 1-24) in Table V, it may be seen that all variables are intercorrelated across the different phases of training to a significance level of at least .01 or better with the vast majority of the relationships being significant to the .001 level or better. For any given phase of training, each unweighted flight index, whether airsickness, vomiting, or performance degradation related, is highly correlated with its weighted counterpart. In this respect it would appear reasonable that, in the future, the collection of inflight airsickness data to serve as test validation criteria may be satisfied with simple incidence (unweighted indices) rather than magnitude measures of a given response.

A further point concerning the many intercorrelations that exist among the flight indices involves the relationship between the airsickness responses across the three phases (basic, advanced, and FRS) of NFO training. The significant correlations shown in Table V between, say, the unweighted airsickness index received during basic training and the same index received during advanced or FRS training, implies that the airsickness difficulties experienced by a typical NFO student during the early phase of flight training will be fairly representative of the difficulties he will experience during the following training phases. Though these correlations are statistically significant, they are generally of low magnitude when the entire NFO study population is treated as a single group as has been done in Table V.

To give some insight into differences in these relationships that might exist across training pipelines, the Table V population was subdivided into three groups representing the VT86-RIO (fighter), the VT86-AJN (attack), and MAFB (P-3) pipelines. A similar Spearman rank correlation analysis was performed to determine the relationship between the unweighted airsickness index received in basic training (variable 1) with the same unweighted index received during advanced training (variable 7), and FRS training (variable 13). The resulting

correlation coefficients are presented in Table VII for each pipeline as well as the corresponding coefficients for all pipelines combined as extracted from Table V. It is readily apparent from Table VII that the strongest relationships exist for the VT86-RIO and VT86-AJN pipelines where the correlation coefficients are in the moderate range. For these pipelines, it is quite probable that the airsickness experiences of a given student during basic training will carry-over into the advanced and FRS phases. In the case of the MAFB pipeline, a significant relationship between basic and advanced airsickness incidence was not present. Again this is accounted for primarily by the very low motion stress received during advanced flight training in the P-43A aircraft at MAFB. However, a significant correlation was present at the .001 level or better between the basic and FRS phases associated with this pipeline.

Table VII

Spearman rank correlation coefficients expressing the relationship between airsickness experienced during basic (primary) training and airsickness experienced during advanced (secondary) and Fleet Readiness Squadron (FRS) training for different pipelines.

BASIC TRAINING			ADVANCED TRAINING	FRS TRAINING
Pipeline Assignment	Flight Index No.	Description	Flight Index No. 7 Airsick-UW	Flight Index No. 13 Airsick-UW
All	1	Airsick-UW	.24*	.48*
VT86-RIO	1	Airsick-UW	.61*	.53*
VT86-AJN	1	Airsick-UW	.58*	.51*
MAFB	1	Airsick-UW	.13	.38*

* = Significant beyond the .001 level.

The Table V correlation matrix also shows that many significant relationships exist between these flight indices and a considerable number of the laboratory test scores. In general, the significant relationships present in Table V follow those reported in the earlier reports (refs. 1-6) where the motion sickness case history (variables 25-27), the BVDT (variables 30-32 and 42), and the VVIT (variables 39-41 and 43) tests show the greatest potential for identifying airsick susceptibles. The data of Table VIII are presented to further expand on the variations in the relative strength of these relationships that occur as a function of the pipeline assignment. This table presents the results of a Spearman rank correlation analysis between the above selected laboratory test scores and the unweighted basic,

TABLE VIII

List of Spearman rank correlation coefficients showing relationship between selected laboratory motion reactivity test scores and student airsickness performance during different phases of training for each of the three major pipelines. Variables 1, 7, and 13 represent the unweighted airsickness indices received by each pipeline population during basic, advanced, and FRS training while variable 19 represents the mean of the airsickness indices received over the entire course of training.

VAR. NO.	LABORATORY TESTS BY PIPELINE	VAR.1 BASIC TRAINING	VAR.7 ADVANCED TRAINING	VAR.13 FRS TRAINING	VAR.19 MEAN INDEX
25	MS History: Part 1				
	All Pipelines	.41*	.19#	.26*	.40#
	VT86-RIO	.43*	.38#	.29	.43*
	VT86-AJN	.27#	.22	.27#	.33#
	MAFB	.51*	.17	.24	.46*
26	MS History: Part 2				
	All Pipelines	.47*	.20*	.36*	.48*
	VT86-RIO	.50*	.37#	.35#	.50*
	VT86-AJN	.41*	.35*	.35*	.40*
	MAFB	.44*	.17	.31#	.31*
27	MS History: Sum				
	All Pipelines	.48*	.23*	.36*	.50*
	VT86-RIO	.52*	.41*	.32#	.50*
	VT86-AJN	.40*	.35*	.40*	.45*
	MAFB	.51*	.19	.33*	.52*
30	BVDT: Rater				
	All Pipelines	.37*	.16	.26*	.38*
	VT86-RIO	.26	.19	.24	.27
	VT86-AJN	.48*	.34*	.23	.42*
	MAFB	.36*	.10	.31*	.13*
31	BVDT: Self-rating				
	All Pipelines	.37*	.20*	.32*	.41*
	VT86-RIO	.36#	.30	.17	.33#
	VT86-AJN	.49*	.40*	.41*	.52*
	MAFB	.35*	.12	.33*	.41*
32	BVDT: Post-rating				
	All Pipelines	.28*	.14	.25*	.31*
	VT86-RIO	.04	.11	-.05	.10
	VT86-AJN	.34*	.30#	.35*	.39*
	MAFB	.34*	.18	.28#	.39*
42	BVDT: Sum				
	All Pipelines	.42*	.26*	.33*	.46*
	VT86-RIO	.33#	.35#	.20	.38#
	VT86-AJN	.53*	.43*	.40*	.55*
	MAFB	.44*	.20	.36*	.49*
39	VVIT: Rater				
	All Pipelines	.22#	.12	.14	.23#
	VT86-RIO	-.09	.18	.27	.11
	VT86-AJN	.33	.08	.23	.25
	MAFB	.25	.12	.06	.23
40	VVIT: Self-rating				
	All Pipelines	.23#	.23#	.28#	.30*
	VT86-RIO	-.07	.22	.36	.15
	VT86-AJN	.55*	.42	.49#	.56*
	MAFB	.19	.18	.16	.22
41	VVIT: Post-rating				
	All Pipelines	.22	.05	.21	.24
	VT86-RIO	-.20	.15	.23	.04
	VT86-AJN	.25	.17	.40#	.35
	MAFB	.28	.19	.09	.25
43	VVIT: Sum				
	All Pipelines	.27#	.15	.21	.29*
	VT86-RIO	-.16	.20	.30	.10
	VT86-AJN	.48*	.28*	.41*	.43*
	MAFB	.28	.20	.08	.25

= Significant to the .01 level or better. * = Significant to the .001 level or better.

advanced, FRS, and mean airsickness indices separately calculated for the student groups following the VT86-RIO, VT86-AJN, and MAFB pipelines. Table VIII also lists corresponding correlation coefficients, extracted from Table V, which are based upon all pipelines combined.

In Table VIII, the righthand column represents the correlations that exist between each laboratory test score and the mean of the airsickness indices received during basic, advanced, and FRS training. All three of the motion sickness history scores show significant correlations with the mean airsickness index that are in the low to moderate range for all of the different pipelines. These correlations are significant to at least the .01 level or better, with the majority being significant to the .001 level or better. Comparison of the correlations as a function of the phase of training indicates that the strongest relationships between the motion sickness history scores and the airsickness indices occured for basic training. In general, the correlations associated with the first part of the motion sickness case history (which dealt with airsickness experiences prior to the age of 12 years) were lower than those associated with the second part (which dealt with airsickness subsequent to the age of 12 years). In the case of the motion sickness case history sum score, this variable was significantly correlated with the airsickness indices received in each phase of training for all pipelines with the single exception of the MAFB group during advanced training.

For the four BVDT related test scores listed in Table VIII, significant correlations with the mean airsickness index were present for all pipeline combinations with the exception of the BVDT rater and post-rating scores for the VT86-RIO population. As before, the correlations between the BVDT scores and airsickness as a function of training phase was greatest during basic training with the VT86-RIO pipeline showing the weakest relationship. In the case of the four VVIT scores, a much weaker relationship existed with the flight data. Low but significant correlations with the mean airsickness index for the combined pipeline populationwere present for all VVIT scores with the single exception of the post-rating component. As a function of pipeline assignment, only the VT86-AJN group reflected a significant relationship with any of the VVIT scores.

SUMMARY RECOMMENDATIONS FOR FUTURE AIRSICKNESS SELECTION TEST RDT&E

This report and the preceding six reports (1-6) of the longitudinal study have documented the relatively high incidence of airsickness present during NFO training. Table IX is a summary tabulation of the basic incidence data collected on 28,383 flights flown by the NFO sample population over the entire course of the study. This table lists the percentage of the total hops flown in a given phase of training where airsickness, vomiting, and inflight performance degradation due to airsickness were

reported to have occurred. For the advanced/secondary and FRS phases of training, separate breakdowns are given for the major training pipelines. The data of Table IX show a general decline in airsickness incidence as training progressed from the basic/primary level, where airsickness was present on over 19 percent of the hops, through the later phases. However, as was stressed earlier in the report, there were considerable variations in incidence according to the pipeline followed. For the

TABLE IX

Summary tabulation of the percent incidence of airsickness, vomiting, and inflight performance degradation reported by the Naval Flight Officer population during different phases of flight training and within different training pipelines. Incidence is expressed as the percentage of the total hops flown in a given phase of training where the denoted response occurred.

Phase of Training	No. Students	Total Hops	Airsickness Hops	Airsickness Percent	Vomiting Hops	Vomiting Percent	Perf. Degrad. Hops	Perf. Degrad. Percent
Primary Training								
VT10	796	10,759	2,086	19.4	984	9.2	1,371	12.7
Secondary Training								
VT86-AJN (Attack)	226	3,385	361	10.7	139	4.1	147	4.3
VT86-[illegible] (Fighter)	185	4,120	697	16.9	309	7.5	233	5.6
MAP [illegible]-3)	132	1,794	46	2.6	4	0.2	9	0.5
Subtotal	543	9,299	1,104	11.9	452	4.9	389	4.2
Fleet Readiness								
Attack	120	3,269	302	9.2	129	3.9	134	4.1
Fighter	89	3,661	173	4.7	78	2.1	79	2.2
P-3	128	900	142	15.8	42	4.7	75	8.3
E-2	35	495	20	4.0	3	0.6	15	3.0
Subtotal	372	8,325	637	7.6	252	3.0	303	3.6
Total - All Phases	796	28,383	3,827	13.5	1,688	5.9	2,063	7.3

fighter pipeline, airsickness incidence was nearly 17 percent during secondary training but fell to less than 5 percent during FRS training; for the attack pipeline, corresponding figures were approximately 11 and 9 percent, respectively. In the case of the F-3 pipeline, airsickness occurred on less than 3 percent of the flights flown during secondary training but rose to nearly 16 percent during FRS training. The over-all magnitude of the airsickness problem during NFO training is summarized by the total listing shown at the bottom of Table IX which indicates that of the total of 28,383 flights for which data were available, airsickness occurred on 3,827 hops or 13.5 percent of the total. On 2,063 of these hops, 7.3 percent of the total, airsickness difficulties were considered to be of sufficient magnitude to cause the students to report a decrement in their flight performance capabilities.

Although the data of Table IX documents the incidence of airsickness for the NFO population as a whole, it does not reflect the considerable variations that existed in individual airsickness susceptibility. For example, in the first report (1) of the longitudinal study involving basic training in Squadron VT10, 74.5 percent of the students reported being airsick on one or more flights. However, 50 percent of the hops where airsickness was present was accounted for by less than 19 percent of the students. In the report (3) dealing with advanced training in VT86-RIO, 83.5 percent of the students reported being airsick on one or more flights but, again, only 19 percent of the students accounted for 50 percent of the total hops where airsickness was present. In effect, if the overall magnitude of the airsickness problem during NFO training is to be significantly reduced, then attention must be given to developing selection tests that have the potential to identify this most susceptible component of the NFO population prior to the time they enter flight training.

Another problem area which the development of an airsickness selection test battery may help address involves the attrition of NFO students once flight training begins. Some students are dismissed from the program as a result of inadequate academic or flight performance. Others are removed as not physically qualified (NPQ) or not aeronautically adaptable (NAA), while some drop out of the program at their own request (DOR). Over the course of the study very few cases of attrition due directly to airsickness could be documented. In the previous reports of the series (1-6), a Kruskal-Wallis one-way analysis of variance comparison was made of the airsickness indices received by the students who graduated from the squadron and the corresponding indices received by those students who attrited voluntarily or otherwise. Significant differences between the two groups were found in only two (3,4) of the six squadron studies. However, the mean airsickness indices were highest for the attrite group in five of the six study groups. Although the case for airsickness-induced attritions is not strong, it is probable that the early detection of airsickness susceptibility may result in a slight reduction in the attrition rate, particularly for the NAA and DOR cases.

Over the course of the study, several of the laboratory motion reactivity tasks given to a large segment of the NFO study population prior to their beginning flight training have been shown to be significantly correlated to different degrees with inflight airsickness. The tests having the highest potential for future development include the BVDT and VVIT. Of all the test data, the motion sickness case history questionnaire had the most consistent correlation with airsickness. However, since the questionnaire data were collected on a private not to be divulged basis, further validation will be required before this test goes operational since it is quite feasible that airsick susceptible students may distort their past motion sickness experiences to gain entry into the NFO training program. In the same respect, other tests of motion reactivity must place emphasis on objective rather than subjective or self-rating measures of response to

motion stress, to minimize the potential of a student deliberately generating misleading data.

Another requirement for the future development of airsickness susceptibility selection tests involves the need for repeat testing exposure. In the present study, access to the NFO student population was provided on a one-time noninterference basis. With this limitation, measures of motion adaptation and retention capabilities which vary widely from individual to individual cannot be readily investigated. Though training time is costly, testing access must be provided over at least two or three successive time periods separated ideally by one or more days.

A last point involves the need for inflight validation data to establish the relative strength of each candidate test undergoing development. Just as the individual motion reactivity tests must be designed to eliminate any bias that may be introduced by the student, so must the method used to document the actual incidence of airsickness during a given flight. In this respect, heavy dependence must be placed on the flight instructor to gauge the incidence and severity of airsickness experienced by a given student. Although the instructor will obviously identify an overt sign such as vomiting, it might be argued that there would be too many limitations imposed on his judgments where airsickness occurred with less obvious signs and symptoms.

The data of this study (1-6), however, has shown a high degree of correlation between the student and flight instructor ratings of airsickness present on a given hop. In Table X, Spearman rank correlation coefficients adjusted for tied scores are presented which show the close relationship between student and instructor ratings (unweighted flight indices) of airsickness incidence as judged to have occurred in different training squadrons. The same form of listing is presented in Table XI for student and instructor ratings of the magnitude or severity of the airsickness experiences. For all three response variables, airsickness, vomiting, and performance degradation, the student and instructor ratings are significantly correlated to the .001 level or better. The correlation coefficients range from 0.85 through 0.97 for the vomiting response as would be expected. Equally important, the student and instructor ratings are highly correlated in the range of 0.69 through 0.86 for the airsickness measure as well. In this respect, it would appear that instructor-based judgments of airsickness incidence and severity will well serve as validation criteria for identification of candidate tests with the highest potential for optimizing aircrew selection.

TABLE X

List of Spearman rank correlation coefficients showing the close relationship between student and instructor ratings (unweighted response variables) of airsickness incidence as judged to have occurred during basic/primary training in Squadron VT10 and advanced/secondary training in Squadrons VT86-AJN and VT86-RIO for both the old and new (current) flight syllabi populations.

RESPONSE VARIABLES BY SQUADRON	RESPONSE VARIABLES BY SYLLABUS					
	Airsickness Syllabus		Vomiting Syllabus		Perf. Degradation Syllabus	
	Old	New	Old	New	Old	New
Squadron VT10						
Airsickness	.80*	.79*				
Vomiting			.93*	.94*		
Perf. Degradation					.71*	.75*
Squadron VT86-AJN						
Airsickness	.71*	.69*				
Vomiting			.92*	.87*		
Perf. Degradation					.55*	.61*
Squadron VT86-RIO						
Airsickness	.77*	.85*				
Vomiting			.95*	.96*		
Perf. Degradation					.63*	.48*

* = Significant beyond the .001 level.

TABLE XI

List of Spearman rank correlation coefficients showing the close relationship between student and instructor ratings (weighted response variables) of airsickness magnitude as judged to have occurred during basic/primary training in Squadron VT10 and advanced/secondary training in Squadrons VT86-AJN and VT86-RIO for both the old and new (current) flight syllabi populations.

RESPONSE VARIABLES BY SQUADRON	RESPONSE VARIABLES BY SYLLABUS					
	Airsickness Syllabus		Vomiting Syllabus		Perf. Degradation Syllabus	
	Old	New	Old	New	Old	New
Squadron VT10						
Airsickness	.84*	.83*				
Vomiting			.93*	.95*		
Perf. Degradation					.75*	.78*
Squadron VT86-AJN						
Airsickness	.74*	.69*				
Vomiting			.92*	.85*		
Perf. Degradation					.59*	.61*
Squadron VT86-RIO						
Airsickness	.77*	.86*				
Vomiting			.96*	.97*		
Perf. Degradation					.65*	.49*

* = Significant beyond the .001 level.

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APPENDIX A

Statistical listings of the flight response indices and laboratory test scores for each of the Naval Flight Officer (NFO) Fleet Readiness Squadrons included in the longitudinal study

TABLE A-1

Statistical listings of the flight response indices and laboratory test scores for the sample NFO population receiving F-14 training in Squadron VF-101.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	7.9	7.4	1.7	.0	25.0	7.9	18
2	BAS-AIRSICKNESS INDEX--W	3.6	4.6	1.1	.0	18.2	2.6	18
3	BAS-VOMITING INDEX-UW	2.8	4.5	1.1	.0	12.5	.0	18
4	BAS-VOMITING INDEX--W	1.0	1.6	.4	.0	4.2	.0	18
5	BAS-PERF.DEGRAD.INDEX-UW	3.5	5.7	1.3	.0	18.2	.0	18
6	BAS-PERF.DEGRAD.INDEX--W	2.1	4.5	1.1	.0	18.2	.0	18
7	ADV-AIRSICKNESS INDEX-UW	11.2	13.6	3.2	.0	51.9	7.1	18
8	ADV-AIRSICKNESS INDEX--W	4.6	5.5	1.3	.0	19.8	2.4	18
9	ADV-VOMITING INDEX-UW	6.2	12.7	3.0	.0	51.9	.0	18
10	ADV-VOMITING INDEX--W	3.0	5.4	1.3	.0	21.0	.0	18
11	ADV-PERF.DEGRAD.INDEX-UW	3.1	3.8	.9	.0	11.1	1.8	18
12	ADV-PERF.DEGRAD.INDEX--W	1.2	1.5	.4	.0	4.6	.6	18
13	FRS-AIRSICKNESS INDEX-UW	8.9	21.8	5.1	.0	92.8	.5	18
14	FRS-AIRSICKNESS INDEX--W	4.7	12.7	3.0	.0	54.8	.5	18
15	FRS-VOMITING INDEX-UW	5.2	16.7	3.9	.0	71.4	.0	18
16	FRS-VOMITING INDEX--W	2.9	9.5	2.2	.0	40.5	.0	18
17	FRS-PERF.DEGRAD.INDEX-UW	4.7	12.1	2.9	.0	50.0	.0	18
18	FRS-PERF.DEGRAD.INDEX--W	1.8	4.6	1.1	.0	19.0	.0	18
19	MEAN-AIRSICK INDICES-UW	9.4	11.5	2.7	.0	44.8	5.3	18
20	MEAN-AIRSICK INDICES--W	4.3	6.0	1.4	.0	25.0	2.0	18
21	MEAN-VOMITING INDICES-UW	4.7	8.7	2.0	.0	30.7	.2	18
22	MEAN-VOMITING INDICES--W	2.3	4.5	1.1	.0	17.7	.4	18
23	MEAN-PER.DEGRAD.INDICES-UW	3.8	5.4	1.3	.0	22.3	1.9	18
24	MEAN-PER.DEGRAD.INDICES--W	1.7	2.5	.6	.0	9.4	.6	18
25	TMSQ1-MS HISTORY: PART 1	9.0	8.6	2.1	.0	31.5	7.2	16
26	TMSQ2-MS HISTORY: PART 2	4.8	6.6	1.7	.0	22.5	2.2	16
27	TMSQ3-MS HISTORY: SUM	13.7	14.2	3.5	.0	43.5	9.5	16
28	TSANX-STATE/ANX.QUEST.	36.1	11.9	4.5	24.0	55.0	34.0	7
29	TTANX-TRAIT/ANX.QUEST.	27.3	5.3	2.0	20.0	33.0	26.0	7
30	TBVDR-BVDT RATER	15.8	9.4	2.4	8.0	38.3	12.1	16
31	TBVDS-BVDT SELF-RATING	14.6	6.3	1.6	6.0	30.0	14.5	16
32	TBVDP-BVDT POST-RATING	10.4	22.7	6.1	.0	84.0	2.5	14
33	TVVSP1-VVIT STATIC-RIGHT	126.4	7.4	2.6	108.0	129.0	129.0	8
34	TVVSP2-VVIT STATIC-WRONG	1.9	5.3	1.9	.0	15.0	.0	8
35	TVVSP3-VVIT STATIC-OMIT	.8	2.1	.8	.0	6.0	.0	8
36	TVVDP1-VVIT DYNAMIC-RIGHT	76.2	36.9	13.1	34.0	129.0	67.0	8
37	TVVDP2-DYNAMIC-WRONG	7.5	6.7	2.4	.0	17.0	7.0	8
38	TVVDP3-VVIT DYNAMIC-OMIT	45.2	34.1	12.1	.0	85.0	48.5	8
39	TVVIR-VVIT RATER	15.6	8.6	3.0	7.5	30.5	11 2	8
40	TVVIS-VVIT SELF-RATING	15.5	6.3	2.2	6.0	28.0	15.5	8
41	TVVIP-POST-RATING	4.9	5.1	1.8	.0	12.0	3.0	8
42	SUM BVDT (30+31+32)	38.4	27.1	7.2	16.3	118.7	31.5	14
43	SUM VVIT (39+40+41)	35.9	18.9	6.7	14.0	69.5	30.7	8

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-II

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving F-14 training in Squadron VF-124.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	13.4	15.7	2.8	.0	50.0	5.6	31
2	BAS-AIRSICKNESS INDEX--W	6.3	7.7	1.4	.0	25.0	1.9	31
3	BAS-VOMITING INDEX-UW	5.1	9.3	1.7	.0	35.0	.0	31
4	BAS-VOMITING INDEX--W	2.7	5.4	1.0	.0	23.3	.0	31
5	BAS-PERF.DEGRAD.INDEX-UW	7.1	9.3	1.7	.0	35.0	5.0	31
6	BAS-PERF.DEGRAD.INDEX--W	3.4	5.2	.9	.0	21.7	1.7	31
7	ADV-AIRSICKNESS INDEX-UW	17.0	23.3	4.2	.0	100.0	7.7	31
8	ADV-AIRSICKNESS INDEX--W	7.3	10.4	1.9	.0	44.4	3.8	31
9	ADV-VOMITING INDEX-UW	8.0	15.4	2.8	.0	66.7	.0	31
10	ADV-VOMITING INDEX--W	3.9	7.9	1.4	.0	37.0	.0	31
11	ADV-PERF DEGRAD.INDEX-UW	4.1	7.5	1.3	.0	28.6	.0	31
12	ADV-PERF.DEGRAD.INDEX--W	1.8	3.0	.5	.0	12.0	.0	31
13	FRS-AIRSICKNESS INDEX-UW	5.5	11.3	2.0	.0	53.8	1.6	31
14	FRS-AIRSICKNESS INDEX--W	2.8	6.7	1.2	.0	33.3	.5	31
15	FRS-VOMITING INDEX-UW	3.2	8.6	1.5	.0	34.6	.0	31
16	FRS-VOMITING INDEX--W	1.6	4.9	.9	.0	21.8	.0	31
17	FRS-PERF DEGRAD.INDEX-UW	2.2	6.1	1.1	.0	30.8	.0	31
18	FRS-PERF.DEGRAD.INDEX--W	1.0	3.2	.6	.0	16.7	.0	31
19	MEAN-AIRSICK INDICES-UW	12.0	14.5	2.6	.0	49.6	5.7	31
20	MEAN-AIRSICK INDICES--W	5.5	7.3	1.3	.0	27.4	2.6	31
21	MEAN-VOMITING INDICES-UW	5.4	9.3	1.7	.0	35.3	1.2	31
22	MEAN-VOMITING INDICES--W	2.7	5.0	.9	.0	19.8	.4	31
23	MEAN-PER.DEGRAD.INDICES-UW	4.5	6.3	1.1	.0	26.5	1.8	31
24	MEAN-PER DEGRAD.INDICES--W	2.1	3.3	.6	.0	13.7	.6	31
25	TMSQ1-MS HISTORY: PART 1	8.4	12.6	3.0	.0	48.0	3.2	18
26	TMSQ2-MS HISTORY: PART 2	4.4	6.4	1.5	.0	20.6	.0	18
27	TMSQ3-MS HISTORY: SUM	12.8	15.7	3.7	.0	48.0	6.7	18
28	TSANX-STATE/ANX.QUEST.	27.3	6.3	1.9	20.0	41.0	27.0	11
29	TTANX-TRAIT/ANX.QUEST.	26.5	7.6	2.3	20.0	43.0	24.0	11
30	TBVDR-BVDT RATER	11.7	5.0	1.2	8.3	31.0	10.3	18
31	TBVDS-BVDT SELF-RATING	10.5	5.3	1.3	5.0	23.0	9.0	18
32	TBVDP-BVDT POST-RATING	.4	.7	.2	.0	2.0	.0	15
33	TVVSP1-VVIT STATIC-RIGHT	125.6	6.0	1.7	109.0	129.0	129.0	12
34	TVVSP2-VVIT STATIC-WRONG	2.7	3.9	1.1	.0	11.0	.0	12
35	TVVSP3-VVIT STATIC-OMIT	.8	2.6	.8	.0	9.0	.0	12
36	TVVDP1-VVIT DYNAMIC-RIGHT	91.5	32.8	9.5	34.0	126.0	98.0	12
37	TVVDP2-DYNAMIC-WRONG	7.6	3.9	1.1	1.0	14.0	8.5	12
38	TVVDP3-VVIT DYNAMIC-OMIT	29.9	32.1	9.3	.0	85.0	21.5	12
39	TVVIR-VVIT RATER	18.0	8.0	2.3	8.5	33.5	18.2	12
40	TVVIS-VVIT SELF-RATING	14.1	7.0	2.0	5.0	23.0	13.0	12
41	TVVIP-POST-RATING	11.9	20.4	5.9	.0	66.0	1.5	12
42	SUM BVDT (30+31+32)	23.3	9.3	2.4	13.3	48.0	22.3	15
43	SUM VVIT (39+40+41)	44.0	32.3	9.3	15.0	117.5	31.5	12

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-III

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving F-4 training in Squadron VF-121.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	13.0	12.1	4.3	.0	35.3	11.8	8
2	BAS-AIRSICKNESS INDEX--W	6.3	6.5	2.3	.0	17.6	3.9	8
3	BAS-VOMITING INDEX-UW	5.0	9.5	3.4	.0	23.5	.0	8
4	BAS-VOMITING INDEX--W	2.9	5.3	1.9	.0	11.8	.0	8
5	BAS-PERF.DEGRAD.INDEX-UW	12.5	12.4	4.4	.0	29.4	11.8	8
6	BAS-PERF.DEGRAD.INDEX--W	5.1	5.6	2.0	.0	15.7	4.9	8
7	ADV-AIRSICKNESS INDEX-UW	19.2	15.7	5.6	6.7	53.3	15.9	8
8	ADV-AIRSICKNESS INDEX--W	7.2	5.8	2.1	2.5	20.0	5.8	8
9	ADV-VOMITING INDEX-UW	4.6	9.1	3.2	.0	26.7	1.6	8
10	ADV-VOMITING INDEX--W	2.1	3.8	1.3	.0	11.1	.5	8
11	ADV-PERF.DEGRAD.INDEX-UW	5.7	7.8	2.8	.0	23.3	3.5	8
12	ADV-PERF.DEGRAD.INDEX--W	2.2	2.9	1.0	.0	8.9	1.7	8
13	FRS-AIRSICKNESS INDEX-UW	20.4	34.2	12.1	.0	94.1	3.5	8
14	FRS-AIRSICKNESS INDEX--W	9.1	15.8	5.6	.0	45.1	1.8	8
15	FRS-VOMITING INDEX-UW	4.5	10.2	3.6	.0	29.4	.0	8
16	FRS-VOMITING INDEX--W	1.8	4.1	1.5	.0	11.8	.0	8
17	FRS-PERF.DEGRAD.INDEX-UW	12.9	32.9	11.6	.0	94.1	.8	8
18	FRS-PERF.DEGRAD.INDEX--W	5.8	13.0	4.6	.0	37.2	.3	8
19	MEAN-AIRSICK INDICES-UW	17.5	18.9	6.7	2.2	60.9	11.7	8
20	MEAN-AIRSICK INDICES--W	7.5	8.5	3.0	1.0	27.6	5.6	8
21	MEAN-VOMITING INDICES-UW	4.7	9.1	3.2	.0	26.5	.9	8
22	MEAN-VOMITING INDICES--W	2.2	4.1	1.4	.0	11.6	.3	8
23	MEAN-PER.DEGRAD.INDICES-UW	10.4	16.0	5.6	.0	48.9	6.3	8
24	MEAN-PER.DEGRAD.INDICES--W	4.1	6.0	2.4	.0	20.6	2.4	8
25	TMSQ1-MS HISTORY, PART 1	7.1	9.7	3.4	.0	30.0	5.1	8
26	TMSQ2-MS HISTORY, PART 2	8.6	7.7	2.7	.0	21.0	6.6	8
27	TMSQ3-MS HISTORY, SUM	15.7	11.4	4.0	.0	36.0	15.0	8
28	TSANX-STATE/ANX.QUEST.	.0	.0	.0	.0	.0	.0	1
29	TTANX-TRAIT/ANX.QUEST.	.0	.0	.0	.0	.0	.0	1
30	TBVDR-BVDT RATER	11.6	3.2	1.1	7.3	16.0	11.8	8
31	TBVDS-BVDT SELF-RATING	13.6	5.4	1.9	5.0	20.0	16.0	8
32	TBVDP-BVDT POST-RATING	10.0	16.7	5.9	.0	44.0	1.0	8
33	TVVSP1-VVIT STATIC-RIGHT	.0	.0	.0	.0	.0	.0	1
34	TVVSP2-VVIT STATIC-WRONG	.0	.0	.0	.0	.0	.0	1
35	TVVSP3-VVIT STATIC-OMIT	.0	.0	.0	.0	.0	.0	1
36	TVVDP1-VVIT DYNAMIC-RIGHT	.0	.0	.0	.0	.0	.0	1
37	TVVDP2-DYNAMIC-WRONG	.0	.0	.0	.0	.0	.0	1
38	TVVDP3-VVIT DYNAMIC-OMIT	.0	.0	.0	.0	.0	.0	1
39	TVVIR-VVIT RATER	.0	.0	.0	.0	.0	.0	1
40	TVVIS-VVIT SELF-RATING	.0	.0	.0	.0	.0	.0	1
41	TVVIP-POST-RATING	.0	.0	.0	.0	.0	.0	1
42	SUM BVDT (30+31+32)	35.2	21.0	7.4	14.7	75.3	28.0	8
43	SUM VVIT (39+40+41)	.0	.0	.0	.0	.0	.0	1

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-IV

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving F-4 training in Squadron VF-171.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	14.8	19.3	5.3	.0	57.1	10.5	13
2	BAS-AIRSICKNESS INDEX--W	6.9	9.7	2.7	.0	33.3	5.3	13
3	BAS-VOMITING INDEX-UW	6.2	13.3	3.7	.0	42.1	.0	13
4	BAS-VOMITING INDEX--W	3.0	7.0	1.9	.0	24.6	.0	13
5	BAS-PERF.DEGRAD.INDEX-UW	6.8	11.8	3.3	.0	42.1	.0	13
6	BAS-PERF.DEGRAD.INDEX--W	3.4	5.4	1.5	.0	19.3	.0	13
7	ADV-AIRSICKNESS INDEX-UW	12.8	19.2	5.3	.0	67.7	6.7	13
8	ADV-AIRSICKNESS INDEX--W	5.5	7.7	2.1	.0	28.0	3.7	13
9	ADV-VOMITING INDEX-UW	4.8	12.4	3.4	.0	45.2	.0	13
10	ADV-VOMITING INDEX--W	2.3	6.8	1.9	.0	24.7	.0	13
11	ADV-PERF.DEGRAD.INDEX-UW	1.8	4.5	1.3	.0	16.1	.0	13
12	ADV-PERF.DEGRAD.INDEX--W	.7	1.6	.4	.0	5.4	.0	13
13	FRS-AIRSICKNESS INDEX-UW	4.1	13.8	3.8	.0	50.0	.0	13
14	FRS-AIRSICKNESS INDEX--W	2.1	6.9	1.9	.0	25.0	.0	13
15	FRS-VOMITING INDEX-UW	1.7	5.1	1.4	.0	18.7	.0	13
16	FRS-VOMITING INDEX--W	1.1	3.4	1.0	.0	12.5	.0	13
17	FRS-PERF.DEGRAD.INDEX-UW	1.2	3.4	1.0	.0	12.5	.0	13
18	FRS-PERF.DEGRAD.INDEX--W	.5	1.2	.3	.0	4.2	.0	13
19	MEAN-AIRSICK INDICES-UW	10.6	15.5	4.3	.0	56.8	4.8	13
20	MEAN-AIRSICK INDICES--W	4.8	7.6	2.1	.0	28.8	2.8	13
21	MEAN-VOMITING INDICES-UW	4.2	9.9	2.7	.0	35.3	.5	13
22	MEAN-VOMITING INDICES--W	2.1	5.6	1.6	.0	20.6	.2	13
23	MEAN-PER.DEGRAD.INDICES-UW	3.3	6.4	1.8	.0	23.6	1.6	13
24	MEAN-PER.DEGRAD.INDICES--W	1.3	2.6	.7	.0	9.6	1.1	13
25	TMSQ1-MS HISTORY, PART 1	8.1	14.9	4.5	.0	47.2	.0	11
26	TMSQ2-MS HISTORY, PART 2	6.4	12.0	3.6	.0	36.0	.0	11
27	TMSQ3-MS HISTORY, SUM	14.4	26.6	8.0	.0	83.2	4.5	11
28	TSANX-STATE/ANX.QUEST.	27.5	5.2	2.6	22.0	34.0	27.0	4
29	TTANX-TRAIT/ANX.QUEST.	30.7	5.9	2.9	24.0	38.0	30.5	4
30	TBVDR-BVDT RATER	9.8	2.0	.6	7.0	15.0	9.3	11
31	TBVDS-BVDT SELF-RATING	11.3	4.5	1.4	6.0	20.0	10.0	11
32	TBVDP-BVDT POST-RATING	1.0	1.3	.4	.0	3.0	.0	11
33	TVVSP1-VVIT STATIC-RIGHT	120.5	4.7	2.4	114.0	124.0	122.0	4
34	TVVSP2-VVIT STATIC-WRONG	5.5	2.5	1.3	3.0	9.0	5.0	4
35	TVVSP3-VVIT STATIC-OMIT	3.0	3.5	1.7	.0	6.0	3.0	4
36	TVVDP1-VVIT DYNAMIC-RIGHT	54.5	18.3	9.1	37.0	74.0	53.5	4
37	TVVDP2-DYNAMIC-WRONG	12.7	15.5	7.8	4.0	36.0	5.5	4
38	TVVDP3-VVIT DYNAMIC-OMIT	61.7	28.9	14.4	27.0	87.0	66.5	4
39	TVVIR-VVIT RATER	20.6	10.1	5.0	10.5	30.5	20.7	4
40	TVVIS-VVIT SELF-RATING	16.5	7.0	3.5	9.0	26.0	15.5	4
41	TVVIP-POST-RATING	9.0	8.3	4.1	1.0	18.0	8.5	4
42	SUM BVDT (30+31+32)	22.1	5.3	1.6	15.7	31.3	20.3	11
43	SUM VVIT (39+40+41)	46.1	24.3	12.1	23.5	74.5	43.2	4

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-V

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving F-4 training in Squadron MCCRTG-10.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	14.9	12.6	3.3	.0	37.5	15.4	15
2	BAS-AIRSICKNESS INDEX--W	7.4	6.8	1.7	.0	18.5	6.3	15
3	BAS-VOMITING INDEX-UW	7.5	11.4	2.9	.0	29.4	.0	15
4	BAS-VOMITING INDEX--W	4.3	7.5	1.9	.0	22.2	.0	15
5	BAS-PERF.DEGRAD.INDEX-UW	7.1	9.1	2.4	.0	27.8	.0	15
6	BAS-PERF.DEGRAD.INDEX--W	3.9	5.6	1.5	.0	16.7	.0	15
7	ADV-AIRSICKNESS INDEX-UW	18.1	12.7	3.3	.0	36.8	17.6	15
8	ADV-AIRSICKNESS INDEX--W	7.4	4.9	1.3	.0	15.8	6.7	15
9	ADV-VOMITING INDEX-UW	6.3	9.6	2.5	.0	31.6	2.9	15
10	ADV-VOMITING INDEX--W	3.5	5.5	1.4	.0	19.3	1.0	15
11	ADV-PERF.DEGRAD.INDEX-UW	4.8	5.7	1.5	.0	17.4	3.6	15
12	ADV-PERF.DEGRAD.INDEX--W	1.9	2.2	.6	.0	5.8	1.2	15
13	FRS-AIRSICKNESS INDEX-UW	6.4	10.7	2.8	.0	40.0	2.2	15
14	FRS-AIRSICKNESS INDEX--W	2.6	4.1	1.1	.0	15.0	.7	15
15	FRS-VOMITING INDEX-UW	3.8	10.3	2.6	.0	40.0	.0	15
16	FRS-VOMITING INDEX--W	1.8	5.1	1.3	.0	20.0	.0	15
17	FRS-PERF.DEGRAD.INDEX-UW	1.1	2.1	.6	.0	6.8	.0	15
18	FRS-PERF.DEGRAD.INDEX--W	.5	1.0	.3	.0	3.0	.0	15
19	MEAN-AIRSICK INDICES-UW	13.1	9.9	2.5	.0	35.4	10.5	15
20	MEAN-AIRSICK INDICES--W	5.8	4.1	1.1	.0	12.4	5.3	15
21	MEAN-VOMITING INDICES-UW	5.9	8.8	2.3	.0	29.7	2.2	15
22	MEAN-VOMITING INDICES--W	3.2	4.8	1.3	.0	15.7	1.2	15
23	MEAN-PER.DEGRAD.INDICES-UW	4.3	4.7	1.2	.0	12.1	3.4	15
24	MEAN-PER.DEGRAD.INDICES--W	2.1	2.6	.7	.0	7.6	1.2	15
25	TMSQ1-MS HISTORY: PART 1	8.4	9.9	2.7	.0	25.7	.0	13
26	TMSQ2-MS HISTORY: PART 2	10.3	18.3	5.1	.0	64.3	2.2	13
27	TMSQ3-MS HISTORY: SUM	18.7	25.3	7.0	.0	90.0	15.4	13
28	TSANX-STATE/ANX.QUEST.	27.2	8.5	4.3	22.0	40.0	23.5	4
29	TTANX-TRAIT/ANX.QUEST.	29.7	7.3	3.7	24.0	40.0	27.5	4
30	TBVDR-BVDT RATER	12.6	3.9	1.1	8.3	23.3	11.3	13
31	TBVDS-BVDT SELF-RATING	12.2	5.5	1.5	5.0	22.0	10.0	13
32	TBVDP-BVDT POST-RATING	2.1	5.7	1.7	.0	20.0	.0	12
33	TVVSP1-VVIT STATIC-RIGHT	121.0	6.6	2.9	111.0	129.0	121.0	5
34	TVVSP2-VVIT STATIC-WRONG	6.2	6.9	3.1	.0	18.0	5.0	5
35	TVVSP3-VVIT STATIC-OMIT	1.8	2.7	1.2	.0	6.0	.0	5
36	TVVDP1-VVIT DYNAMIC-RIGHT	94.6	33.1	14.8	52.0	127.0	102.0	5
37	TVVDP2-DYNAMIC-WRONG	5.8	5.6	2.5	1.0	15.0	3.0	5
38	TVVDP3-VVIT DYNAMIC-OMIT	28.6	32.5	14.5	1.0	78.0	12.0	5
39	TVVIR-VVIT RATER	10.6	3.5	1.5	7.0	15.0	9.0	5
40	TVVIS-VVIT SELF-RATING	13.0	8.4	3.8	5.0	24.0	8.0	5
41	TVVIP-POST-RATING	1.4	2.2	1.0	.0	5.0	.0	5
42	SUM BVDT (30+31+32)	26.0	13.1	3.8	13.7	62.3	22.0	12
43	SUM VVIT (39+40+41)	25.0	13.5	6.0	14.0	41.0	16.5	5

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-VI

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving E-2 training in Squadron RVAW-110.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	18.8	15.9	4.0	.0	50.3	18.3	16
2	BAS-AIRSICKNESS INDEX--W	8.6	8.2	2.0	.0	30.6	7.6	16
3	BAS-VOMITING INDEX-UW	7.9	14.8	3.7	.0	50.3	.0	16
4	BAS-VOMITING INDEX--W	5.9	12.7	3.2	.0	50.0	.0	16
5	BAS-PERF.DEGRAD.INDEX-UW	11.8	15.1	3.8	.0	50.3	5.6	16
6	BAS-PERF.DEGRAD.INDEX--W	5.8	7.7	1.9	.0	30.6	3.5	16
7	ADV-AIRSICKNESS INDEX-UW	.0	.0	.0	.0	.0	.0	0
8	ADV-AIRSICKNESS INDEX--W	.0	.0	.0	.0	.0	.0	0
9	ADV-VOMITING INDEX-UW	.0	.0	.0	.0	.0	.0	0
10	ADV-VOMITING INDEX--W	.0	.0	.0	.0	.0	.0	0
11	ADV-PERF.DEGRAD.INDEX-UW	.0	.0	.0	.0	.0	.0	0
12	ADV-PERF.DEGRAD.INDEX--W	.0	.0	.0	.0	.0	.0	0
13	FRS-AIRSICKNESS INDEX-UW	2.5	4.3	1.1	.0	14.3	.0	16
14	FRS-AIRSICKNESS INDEX--W	1.3	2.0	.5	.0	4.8	.0	16
15	FRS-VOMITING INDEX-UW	.4	1.0	.4	.0	7.1	.0	16
16	FRS-VOMITING INDEX--W	.2	.6	.2	.0	2.4	.0	16
17	FRS-PERF.DEGRAD.INDEX-UW	.4	1.0	.4	.0	7.1	.0	16
18	FRS-PERF.DEGRAD.INDEX--W	.3	1.2	.3	.0	4.8	.0	16
19	MEAN-AIRSICK INDICES-UW	10.3	9.5	2.4	.0	36.3	9.2	16
20	MEAN-AIRSICK INDICES--W	4.9	4.7	1.2	.0	17.7	3.8	16
21	MEAN-VOMITING INDICES-UW	4.2	7.6	1.9	.0	29.2	.0	16
22	MEAN-VOMITING INDICES--W	3.0	6.4	1.6	.0	25.0	.0	16
23	MEAN-PER.DEGRAD.INDICES-UW	6.1	7.6	1.9	.0	29.2	2.8	16
24	MEAN-PER.DEGRAD.INDICES--W	3.0	3.9	1.0	.0	15.3	1.0	16
25	TMSQ1-MS HISTORY: PART 1	6.9	7.9	2.5	.0	25.0	6.4	10
26	TMSQ2-MS HISTORY: PART 2	4.5	5.9	1.9	.0	16.0	2.2	10
27	TMSQ3-MS HISTORY: SUM	11.4	13.1	4.1	.0	41.0	10.2	10
28	TSANX-STATE/ANX.QUEST.	32.0	9.0	4.4	21.0	47.0	33.0	5
29	TTANX-TRAIT/ANX.QUEST.	33.4	11.3	5.1	22.0	48.0	31.0	5
30	TBVDR-BVDT RATER	11.6	4.8	1.5	7.7	24.3	10.6	10
31	TBVDS-BVDT SELF-RATING	14.3	6.7	2.1	7.0	27.0	13.6	10
32	TBVDP-BVDT POST-RATING	4.0	3.0	1.3	.0	10.0	3.0	9
33	TVVSP1-VVIT STATIC-RIGHT	122.0	7.3	3.3	110.0	129.0	124.0	5
34	TVVSP2-VVIT STATIC-WRONG	5.2	6.3	2.8	.0	16.0	3.0	5
35	TVVSP3-VVIT STATIC-OMIT	1.0	1.6	.7	.0	3.0	3.0	5
36	TVVDP1-VVIT DYNAMIC-RIGHT	72.2	25.9	11.6	36.0	95.0	84.0	5
37	TVVDP2-DYNAMIC-WRONG	11.0	5.1	2.3	2.0	15.0	13.0	5
38	TVVDP3-VVIT DYNAMIC-OMIT	45.8	29.5	13.2	21.0	91.0	32.0	5
39	TVVIR-VVIT RATER	14.8	3.5	1.6	8.5	17.0	16.0	5
40	TVVIS-VVIT SELF-RATING	20.0	9.2	4.1	5.0	28.0	23.0	5
41	TVVIP-POST-RATING	18.4	25.2	11.3	.0	60.0	7.0	5
42	SUM BVDT (30+31+32)	31.1	11.3	3.8	17.3	47.0	30.3	9
43	SUM VVIT (39+40+41)	53.2	33.3	14.9	13.5	104.5	49.0	5

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-VII

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving E-2 training in Squadron RVAW-120.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	23.2	16.9	4.0	.0	58.8	24.8	18
2	BAS-AIRSICKNESS INDEX--W	12.5	9.4	2.2	.0	27.5	13.9	18
3	BAS-VOMITING INDEX-UW	13.1	12.2	2.9	.0	38.5	11.8	18
4	BAS-VOMITING INDEX--W	7.8	8.4	2.0	.0	23.1	4.1	18
5	BAS-PERF.DEGRAD.INDEX-UW	20.3	20.3	4.8	.0	82.4	15.8	18
6	BAS-PERF.DEGRAD.INDEX--W	9.8	9.1	2.1	.0	35.3	9.5	18
7	ADV-AIRSICKNESS INDEX-UW	.0	.0	.0	.0	.0	.0	0
8	ADV-AIRSICKNESS INDEX--W	.0	.0	.0	.0	.0	.0	0
9	ADV-VOMITING INDEX-UW	.0	.0	.0	.0	.0	.0	0
10	ADV-VOMITING INDEX--W	.0	.0	.0	.0	.0	.0	0
11	ADV-PERF.DEGRAD.INDEX-UW	.0	.0	.0	.0	.0	.0	0
12	ADV-PERF.DEGRAD.INDEX--W	.0	.0	.0	.0	.0	.0	0
13	FRS-AIRSICKNESS INDEX-UW	6.4	13.0	3.1	.0	41.7	.0	18
14	FRS-AIRSICKNESS INDEX--W	2.8	5.9	1.4	.0	19.4	.0	18
15	FRS-VOMITING INDEX-UW	.9	2.7	.6	.0	9.1	.0	18
16	FRS-VOMITING INDEX--W	.3	.9	.2	.0	3.0	.0	18
17	FRS-PERF.DEGRAD.INDEX-UW	6.6	23.5	5.5	.0	100.0	.0	18
18	FRS-PERF.DEGRAD.INDEX--W	2.2	7.8	1.8	.0	33.3	.0	18
19	MEAN-AIRSICK INDICES-UW	14.8	13.6	3.2	.0	50.3	12.4	18
20	MEAN-AIRSICK INDICES--W	7.6	6.7	1.6	.0	23.4	7.0	18
21	MEAN-VOMITING INDICES-UW	7.0	6.7	1.6	.0	19.6	5.9	18
22	MEAN-VOMITING INDICES--W	4.1	4.3	1.0	.0	11.5	2.0	18
23	MEAN-PER.DEGRAD.INDICES-UW	13.4	20.6	4.8	.0	91.2	9.6	18
24	MEAN-PER.DEGRAD.INDICES--W	6.0	7.8	1.8	.0	34.3	5.2	18
25	TMSQ1-MS HISTORY: PART 1	8.8	11.9	3.3	.0	45.0	6.0	13
26	TMSQ2-MS HISTORY: PART 2	8.3	10.4	2.9	.0	36.0	5.1	13
27	TMSQ3-MS HISTORY: SUM	17.1	21.1	5.9	.0	81.0	12.0	13
28	TSANX-STATE/ANX.QUEST	27.7	3.3	1.7	23.0	30.0	29.0	4
29	TTANX-TRAIT/ANX.QUEST	28.7	5.7	2.9	22.0	36.0	28.5	4
30	TBVDR-BVDT RATER	14.6	7.3	2.0	7.7	35.0	11.7	13
31	TBVDS-BVDT SELF-RATING	13.6	7.8	2.2	5.0	28.0	11.0	13
32	TBVDP-BVDT POST-RATING	4.2	7.0	1.9	.0	20.0	.0	13
33	TVVSP1-VVIT STATIC-RIGHT	119.6	11.3	5.0	100.0	127.0	123.0	5
34	TVVSP2-VVIT STATIC-WRONG	6.4	7.7	3.4	2.0	20.0	3.0	5
35	TVVSP3-VVIT STATIC-OMIT	3.0	3.7	1.6	.0	9.0	3.0	5
36	TVVDP1-VVIT DYNAMIC-RIGHT	70.6	26.5	11.9	43.0	108.0	69.0	5
37	TVVDP2-DYNAMIC-WRONG	7.8	5.6	2.5	2.0	15.0	7.0	5
38	TVVDP3-VVIT DYNAMIC-OMIT	50.6	27.5	12.3	18.0	84.0	45.0	5
39	TVVIR-VVIT RATER	13.7	4.9	2.2	8.5	20.5	12.0	5
40	TVVIS-VVIT SELF-RATING	15.2	5.5	2.5	7.0	19.0	19.0	5
41	TVVIP-POST-RATING	6.8	6.8	3.1	.0	14.0	5.0	5
42	SUM BVDT (30+31+32)	32.4	18.2	5.1	17.0	75.0	22.7	13
43	SUM VVIT (39+40+41)	35.7	15.7	7.0	15.5	53.5	41.0	5

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-VIII

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving A-6 training in Squadron VA-42.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	20.6	22.4	5.3	.0	100.0	18.3	18
2	BAS-AIRSICKNESS INDEX--W	8.5	7.9	1.9	.0	33.3	7.2	18
3	BAS-VOMITING INDEX-UW	12.1	23.3	5.5	.0	100.0	5.4	18
4	BAS-VOMITING INDEX--W	4.8	8.1	1.9	.0	33.3	1.8	18
5	BAS-PERF.DEGRAD.INDEX-UW	6.8	8.5	2.0	.0	25.0	2.6	18
6	BAS-PERF.DEGRAD.INDEX--W	3.0	3.9	.9	.0	11.1	.9	18
7	ADV-AIRSICKNESS INDEX-UW	8.5	10.1	2.4	.0	42.1	6.3	18
8	ADV-AIRSICKNESS INDEX--W	3.3	4.3	1.0	.0	17.5	2.1	18
9	ADV-VOMITING INDEX-UW	2.7	5.0	1.2	.0	16.7	.0	18
10	ADV-VOMITING INDEX--W	1.3	2.4	.6	.0	6.7	.0	18
11	ADV-PERF.DEGRAD.INDEX-UW	.9	2.7	.6	.0	10.5	.0	18
12	ADV-PERF.DEGRAD.INDEX--W	.3	.9	.2	.0	3.5	.0	18
13	FRS-AIRSICKNESS INDEX-UW	9.8	8.4	2.0	.0	26.7	8.3	18
14	FRS-AIRSICKNESS INDEX--W	4.3	3.7	.9	.0	13.3	3.4	18
15	FRS-VOMITING INDEX-UW	3.6	4.9	1.1	.0	15.5	1.2	18
16	FRS-VOMITING INDEX--W	1.6	2.1	.5	.0	5.9	.5	18
17	FRS-PERF.DEGRAD.INDEX-UW	5.6	7.1	1.7	.0	25.0	2.9	18
18	FRS-PERF.DEGRAD.INDEX--W	2.1	2.5	.6	.0	8.3	1.4	18
19	MEAN-AIRSICK INDICES-UW	12.9	10.1	2.4	.0	39.1	9.8	18
20	MEAN-AIRSICK INDICES--W	5.4	4.2	1.0	.0	15.0	3.9	18
21	MEAN-VOMITING INDICES-UW	6.1	9.6	2.3	.0	39.1	1.8	18
22	MEAN-VOMITING INDICES--W	2.6	3.8	.9	.0	15.3	.6	18
23	MEAN-PER.DEGRAD.INDICES-UW	4.4	4.7	1.1	.0	13.7	2.8	18
24	MEAN-PER.DEGRAD.INDICES--W	1.8	1.9	.4	.0	5.2	1.1	18
25	TMSQ1-MS HISTORY: PART 1	5.3	6.7	1.7	.0	23.0	2.3	15
26	TMSQ2-MS HISTORY: PART 2	3.5	4.6	1.2	.0	10.3	.0	15
27	TMSQ3-MS HISTORY. SUM	8.8	8.9	2.3	.0	32.0	10.3	15
28	TSANX-STATE/ANX.QUEST.	36.0	6.6	3.3	27.0	41.0	38.0	4
29	TTANX-TRAIT/ANX.QUEST.	29.7	1.7	.9	28.0	32.0	29.5	4
30	TBVDR-BVDT RATER	17.3	8.0	2.1	8.3	33.7	13.3	15
31	TBVDS-BVDT SELF-RATING	16.0	6.9	1.8	6.0	29.0	16.0	15
32	TBVDP-BVDT POST-RATING	4.1	10.3	2.6	.0	40.0	.0	15
33	TVVSP1-VVIT STATIC-RIGHT	117.2	8.8	3.6	104.0	129.0	117.5	6
34	TVVSP2-VVIT STATIC-WRONG	9.8	7.3	3.0	.0	22.0	10.0	6
35	TVVSP3-VVIT STATIC-OMIT	2.0	2.4	1.0	.0	6.0	1.5	6
36	TVVDP1-VVIT DYNAMIC-RIGHT	43.2	37.2	15.2	9.0	111.0	37.0	6
37	TVVDP2-DYNAMIC-WRONG	9.3	8.8	3.6	.0	25.0	7.0	6
38	TVVDP3-VVIT DYNAMIC-OMIT	76.5	39.3	16.0	14.0	120.0	81.5	6
39	TVVIR-VVIT RATER	22.1	11.0	4.5	10.5	35.0	22.0	6
40	TVVIS-VVIT SELF-RATING	21.0	7.5	3.1	9.0	31.0	24.0	6
41	TVVIP-POST-RATING	10.3	13.0	5.3	.0	36.0	6.0	6
42	SUM BVDT (30+31+32)	37.4	18.7	4.8	15.0	69.3	29.3	15
43	SUM VVIT (39+40+41)	54.2	26.9	11.0	19.5	97.0	54.0	6

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-IX

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving A-6 training in Squadron VA-128.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	18.3	15.7	3.4	.0	46.2	11.8	21
2	BAS-AIRSICKNESS INDEX--W	9.6	10.4	2.3	.0	35.9	5.3	21
3	BAS-VOMITING INDEX-UW	8.3	11.0	2.4	.0	30.8	5.3	21
4	BAS-VOMITING INDEX--W	4.1	6.2	1.3	.0	19.6	1.8	21
5	BAS-PERF.DEGRAD.INDEX-UW	10.9	12.6	2.8	.0	36.8	5.6	21
6	BAS-PERF.DEGRAD.INDEX--W	5.8	7.5	1.6	.0	25.6	1.9	21
7	ADV-AIRSICKNESS INDEX-UW	13.0	11.6	2.5	.0	38.1	14.3	21
8	ADV-AIRSICKNESS INDEX--W	5.6	5.5	1.2	.0	19.0	4.8	21
9	ADV-VOMITING INDEX-UW	4.7	7.1	1.5	.0	21.4	.0	21
10	ADV-VOMITING INDEX--W	2.5	4.4	1.0	.0	14.6	.0	21
11	ADV-PERF.DEGRAD.INDEX-UW	5.0	6.7	1.5	.0	21.4	.0	21
12	ADV-PERF.DEGRAD.INDEX--W	2.2	3.1	.7	.0	10.6	.0	21
13	FRS-AIRSICKNESS INDEX-UW	8.5	11.0	2.4	.0	36.8	3.8	21
14	FRS-AIRSICKNESS INDEX--W	4.5	5.8	1.3	.0	19.3	1.9	21
15	FRS-VOMITING INDEX-UW	4.3	6.1	1.3	.0	18.4	1.0	21
16	FRS-VOMITING INDEX--W	2.2	3.3	.7	.0	10.7	.6	21
17	FRS-PERF.DEGRAD.INDEX-UW	3.9	5.0	1.1	.0	20.7	2.4	21
18	FRS-PERF.DEGRAD.INDEX--W	1.0	3.2	.7	.0	14.4	1.3	21
19	MEAN-AIRSICK INDICES-UW	13.3	10.8	2.4	.0	35.4	11.3	21
20	MEAN-AIRSICK INDICES--W	6.6	6.3	1.4	.0	20.6	4.8	21
21	MEAN-VOMITING INDICES-UW	5.7	7.1	1.5	.0	22.1	2.8	21
22	MEAN-VOMITING INDICES--W	3.0	4.1	.9	.0	12.5	1.1	21
23	MEAN-PER.DEGRAD.INDICES-UW	6.6	6.6	1.5	.0	20.8	4.8	21
24	MEAN-PER.DEGRAD.INDICES--W	3.2	3.8	.8	.0	11.4	1.6	21
25	TMSQ1-MS HISTORY: PART 1	13.7	16.4	4.2	.0	51.0	9.0	15
26	TMSQ2-MS HISTORY: PART 2	7.9	7.7	2.0	.0	24.0	5.1	15
27	TMSQ3-MS HISTORY: SUM	21.6	21.5	5.5	.0	74.1	13.5	15
28	TSANX-STATE/ANX.QUEST.	34.6	6.4	2.9	28.0	42.0	36.0	5
29	TTANX-TRAIT/ANX.QUEST.	33.8	8.8	3.9	28.0	49.0	31.0	5
30	TBVDR-BVDT RATER	14.9	8.9	2.3	6.0	36.0	13.3	15
31	TBVDS-BVDT SELF-RATING	17.0	7.5	1.9	7.0	30.0	15.0	15
32	TBVDP-BVDT POST-RATING	7.3	19.9	5.1	.0	78.0	.0	15
33	TVVSP1-VVIT STATIC-RIGHT	127.2	1.6	.7	126.0	129.0	126.0	5
34	TVVSP2-VVIT STATIC-WRONG	1.2	1.6	.7	.0	3.0	.0	5
35	TVVSP3-VVIT STATIC-OMIT	.6	1.3	.6	.0	3.0	.0	5
36	TVVDP1-VVIT DYNAMIC-RIGHT	91.4	33.2	14.8	52.0	125.0	105.0	5
37	TVVDP2-DYNAMIC-WRONG	15.4	9.6	4.3	4.0	26.0	15.0	5
38	TVVDP3-VVIT DYNAMIC-OMIT	22.2	27.8	12.4	.0	54.0	6.0	5
39	TVVIR-VVIT RATER	13.0	6.9	3.1	7.5	24.5	12.5	5
40	TVVIS-VVIT SELF-RATING	15.2	5.0	2.2	10.0	21.0	13.0	5
41	TVVIP-POST-RATING	9.0	18.5	8.3	.0	42.0	1.0	5
42	SUM BVDT (30+31+32)	39.2	25.8	6.7	15.0	109.3	31.0	15
43	SUM VVIT (39+40+41)	37.2	28.3	12.7	18.5	87.5	27.0	5

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-X

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving A-6 training in Squadron MAG-14.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	26.5	14.4	4.8	.0	45.0	31.6	9
2	BAS-AIRSICKNESS INDEX--W	13.0	8.1	2.7	.0	25.0	14.8	9
3	BAS-VOMITING INDEX-UW	10.8	12.5	4.2	.0	33.3	10.0	9
4	BAS-VOMITING INDEX--W	5.4	6.2	2.1	.0	16.7	5.0	9
5	BAS-PERF.DEGRAD.INDEX-UW	15.8	10.3	3.4	.0	26.3	20.0	9
6	BAS-PERF.DEGRAD.INDEX--W	7.5	4.8	1.6	.0	13.3	9.1	9
7	ADV-AIRSICKNESS INDEX-UW	12.6	12.2	4.1	.0	35.0	9.1	9
8	ADV-AIRSICKNESS INDEX--W	6.1	5.9	2.0	.0	16.7	3.5	9
9	ADV-VOMITING INDEX-UW	6.1	5.3	1.8	.0	13.3	5.9	9
10	ADV-VOMITING INDEX--W	3.4	3.8	1.3	.0	11.1	3.0	9
11	ADV-PERF.DEGRAD.INDEX-UW	6.3	9.2	3.1	.0	26.3	.0	9
12	ADV-PERF.DEGRAD.INDEX--W	2.3	3.3	1.1	.0	8.8	.0	9
13	FRS-AIRSICKNESS INDEX-UW	20.4	27.9	9.3	.0	81.1	11.1	9
14	FRS-AIRSICKNESS INDEX--W	10.0	13.5	4.5	.0	41.4	8.1	9
15	FRS-VOMITING INDEX-UW	8.0	11.3	3.8	.0	29.7	2.7	9
16	FRS-VOMITING INDEX--W	3.7	6.1	2.0	.0	18.0	.9	9
17	FRS-PERF.DEGRAD.INDEX-UW	8.3	10.0	3.3	.0	21.6	.0	9
18	FRS-PERF.DEGRAD.INDEX--W	3.9	4.9	1.6	.0	11.7	.0	9
19	MEAN-AIRSICK INDICES-UW	19.8	12.8	4.3	.0	41.5	20.4	9
20	MEAN-AIRSICK INDICES--W	9.7	6.8	2.3	.0	21.7	9.6	9
21	MEAN-VOMITING INDICES-UW	8.3	8.8	2.9	.0	22.6	6.4	9
22	MEAN-VOMITING INDICES--W	4.2	4.6	1.5	.0	12.7	3.3	9
23	MEAN-PER.DEGRAD.INDICES-UW	10.1	7.3	2.4	.0	18.9	12.7	9
24	MEAN-PER.DEGRAD.INDICES--W	4.6	3.4	1.1	.0	9.4	4.9	9
25	TMSQ1-MS HISTORY: PART 1	17.7	9.1	4.1	10.0	29.6	13.5	5
26	TMSQ2-MS HISTORY: PART 2	16.5	16.4	7.3	4.0	45.0	10.3	5
27	TMSQ3-MS HISTORY: SUM	34.2	22.9	10.2	19.3	74.6	24.0	5
28	TSANX-STATE/ANX.QUEST.	.0	.0	.0	.0	.0	.0	1
29	TTANX-TRAIT/ANX.QUEST.	.0	.0	.0	.0	.0	.0	1
30	TBVDR-BVDT RATER	19.6	7.4	3.3	12.3	31.3	17.0	5
31	TBVDS-BVDT SELF-RATING	21.8	6.8	3.1	13.0	31.0	22.0	5
32	TBVDP-BVDT POST-RATING	25.2	22.3	10.0	3.0	60.0	18.0	5
33	TVVSP1-VVIT STATIC-RIGHT	.0	.0	.0	.0	.0	.0	1
34	TVVSP2-VVIT STATIC-WRONG	.0	.0	.0	.0	.0	.0	1
35	TVVSP3-VVIT STATIC-OMIT	.0	.0	.0	.0	.0	.0	1
36	TVVDP1-VVIT DYNAMIC-RIGHT	.0	.0	.0	.0	.0	.0	1
37	TVVDP2-DYNAMIC-WRONG	.0	.0	.0	.0	.0	.0	1
38	TVVDP3-VVIT DYNAMIC-OMIT	.0	.0	.0	.0	.0	.0	1
39	TVVIR-VVIT RATER	.0	.0	.0	.0	.0	.0	1
40	TVVIS-VVIT SELF-RATING	.0	.0	.0	.0	.0	.0	1
41	TVVIP-POST-RATING	.0	.0	.0	.0	.0	.0	1
42	SUM BVDT (30+31+32)	66.6	29.3	13.1	37.3	97.3	65.0	5
43	SUM VVIT (39+40+41)	.0	.0	.0	.0	.0	.0	1

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-XI

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving EA-6 training in Squadron VAQ-129.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	15.3	12.2	2.2	.0	45.0	10.5	32
2	BAS-AIRSICKNESS INDEX--W	7.6	7.1	1.3	.0	25.9	5.5	32
3	BAS-VOMITING INDEX-UW	8.5	11.8	2.1	.0	33.3	.0	32
4	BAS-VOMITING INDEX--W	4.7	6.7	1.2	.0	24.1	.0	32
5	BAS-PERF.DEGRAD.INDEX-UW	10.1	10.9	1.9	.0	36.8	7.4	32
6	BAS-PERF.DEGRAD.INDEX--W	4.7	5.5	1.0	.0	23.2	3.4	32
7	ADV-AIRSICKNESS INDEX-UW	11.4	14.8	2.7	.0	55.6	5.9	30
8	ADV-AIRSICKNESS INDEX--W	5.1	7.4	1.4	.0	25.9	2.2	30
9	ADV-VOMITING INDEX-UW	4.8	10.2	1.9	.0	44.4	.0	30
10	ADV-VOMITING INDEX--W	2.0	4.0	.7	.0	14.8	.0	30
11	ADV-PERF.DEGRAD.INDEX-UW	3.4	6.1	1.1	.0	26.9	.0	30
12	ADV-PERF.DEGRAD.INDEX--W	1.4	2.5	.4	.0	10.3	.0	30
13	FRS-AIRSICKNESS INDEX-UW	14.2	24.1	4.3	.0	100.0	5.6	32
14	FRS-AIRSICKNESS INDEX--W	7.8	17.1	3.0	.0	86.7	3.0	32
15	FRS-VOMITING INDEX-UW	10.2	24.5	4.3	.0	100.0	.0	32
16	FRS-VOMITING INDEX--W	5.6	14.5	2.6	.0	66.7	.0	32
17	FRS-PERF.DEGRAD.INDEX-UW	6.3	18.0	3.2	.0	100.0	.0	32
18	FRS-PERF.DEGRAD.INDEX--W	2.4	6.2	1.1	.0	33.3	.0	32
19	MEAN-AIRSICK INDICES-UW	13.7	13.2	2.3	.0	49.6	7.6	32
20	MEAN-AIRSICK INDICES--W	6.9	8.4	1.5	.0	40.1	3.7	32
21	MEAN-VOMITING INDICES-UW	8.0	12.0	2.1	.0	49.6	2.1	32
22	MEAN-VOMITING INDICES--W	4.2	7.0	1.2	.0	32.8	.9	32
23	MEAN-PER.DEGRAD.INDICES-UW	6.8	8.6	1.5	.0	35.9	3.5	32
24	MEAN-PER.DEGRAD.INDICES--W	3.0	3.9	.7	.0	14.9	1.3	32
25	TMSQ1-MS HISTORY: PART 1	6.6	8.4	1.5	.0	38.0	5.6	32
26	TMSQ2-MS HISTORY: PART 2	7.3	8.3	1.5	.0	32.0	6.8	32
27	TMSQ3-MS HISTORY: SUM	13.9	14.1	2.5	.0	70.0	12.9	32
28	TSANX-STATE/ANX.QUEST.	31.4	8.0	2.3	20.0	43.0	30.5	12
29	TTANX-TRAIT/ANX.QUEST.	26.7	3.2	.9	21.0	32.0	27.5	12
30	TBVDR-BVDT RATER	13.0	5.7	1.0	7.7	32.7	11.1	32
31	TBVDS-BVDT SELF-RATING	14.0	6.9	1.2	5.0	26.0	12.5	32
32	TBVDP-BVDT POST-RATING	5.5	12.2	2.2	.0	45.0	.0	32
33	TVVSP1-VVIT STATIC-RIGHT	125.1	5.1	1.4	112.0	129.0	126.0	14
34	TVVSP2-VVIT STATIC-WRONG	2.9	4.8	1.3	.0	17.0	.5	14
35	TVVSP3-VVIT STATIC-OMIT	.9	2.7	.7	.0	10.0	.0	14
36	TVVDP1-VVIT DYNAMIC-RIGHT	59.1	35.6	9.5	10.0	122.0	52.0	14
37	TVVDP2-DYNAMIC-WRONG	8.4	7.0	1.9	.0	28.0	7.5	14
38	TVVDP3-VVIT DYNAMIC-OMIT	61.5	37.8	10.1	1.0	114.0	61.0	14
39	TVVIR-VVIT RATER	18.0	8.6	2.3	8.5	39.0	16.0	14
40	TVVIS-VVIT SELF-RATING	16.0	8.2	2.2	5.0	28.0	15.5	14
41	TVVIP-POST-RATING	5.7	8.9	2.4	.0	30.0	1.0	14
42	SUM BVDT (30+31+32)	32.6	19.4	3.4	15.0	102.7	27.2	32
43	SUM VVIT (39+40+41)	39.7	22.1	5.9	15.5	79.5	35.0	14

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-XII

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving P-3 training in Squadron VP-30.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	25.9	24.1	2.9	.0	80.0	20.0	67
2	BAS-AIRSICKNESS INDEX--W	13.2	13.6	1.7	.0	60.0	11.1	67
3	BAS-VOMITING INDEX-UW	10.9	16.3	2.0	.0	60.0	.0	67
4	BAS-VOMITING INDEX--W	5.8	9.6	1.2	.0	33.3	.0	67
5	BAS-PERF.DEGRAD.INDEX-UW	17.2	21.7	2.7	.0	100.0	12.5	67
6	BAS-PERF.DEGRAD.INDEX--W	8.6	11.9	1.5	.0	60.0	4.2	67
7	ADV-AIRSICKNESS INDEX-UW	2.4	5.1	.6	.0	23.5	.0	65
8	ADV-AIRSICKNESS INDEX--W	.9	2.0	.3	.0	9.8	.0	65
9	ADV-VOMITING INDEX-UW	.0	.0	.0	.0	.0	.0	65
10	ADV-VOMITING INDEX--W	.0	.0	.0	.0	.0	.0	65
11	ADV-PERF.DEGRAD.INDEX-UW	.4	1.4	.2	.0	6.2	.0	65
12	ADV-PERF.DEGRAD.INDEX--W	.2	.6	.1	.0	3.9	.0	65
13	FRS-AIRSICKNESS INDEX-UW	18.9	22.1	2.6	.0	100.0	16.7	71
14	FRS-AIRSICKNESS INDEX--W	9.5	13.1	1.5	.0	61.1	5.6	71
15	FRS-VOMITING INDEX-UW	5.3	13.3	1.6	.0	66.7	.0	71
16	FRS-VOMITING INDEX--W	3.0	8.7	1.0	.0	38.9	.0	71
17	FRS-PERF.DEGRAD.INDEX-UW	11.2	19.3	2.3	.0	100.0	.0	71
18	FRS-PERF.DEGRAD.INDEX--W	5.2	10.4	1.2	.0	55.6	.0	71
19	MEAN-AIRSICK INDICES-UW	16.2	14.5	1.7	.0	60.0	13.3	71
20	MEAN-AIRSICK INDICES--W	8.0	8.3	1.0	.0	37.0	5.9	71
21	MEAN-VOMITING INDICES-UW	5.4	8.7	1.0	.0	30.0	.0	71
22	MEAN-VOMITING INDICES--W	2.9	5.3	.6	.0	20.8	.0	71
23	MEAN-PER.DEGRAD.INDICES-UW	9.7	12.6	1.5	.0	66.7	6.7	71
24	MEAN-PER.DEGRAD.INDICES--W	4.7	7.0	.8	.0	38.5	2.2	71
25	TMSQ1-MS HISTORY, PART 1	10.2	13.6	1.7	.0	52.5	4.5	61
26	TMSQ2-MS HISTORY, PART 2	8.4	11.5	1.5	.0	60.0	5.1	61
27	TMSQ3-MS HISTORY, SUM	18.6	23.4	3.0	.0	100.5	10.3	61
28	TSANX-STATE/ANX.QUEST.	31.9	10.5	1.9	20.0	57.0	29.0	29
29	TTANX-TRAIT/ANX.QUEST.	30.2	5.7	1.1	20.0	41.0	30.0	29
30	TBVDR-BVDT RATER	14.8	7.1	.9	7.3	37.3	12.3	61
31	TBVDS-BVDT SELF-RATING	15.1	6.9	.9	5.0	34.0	14.0	61
32	TBVDP-BVDT POST-RATING	7.7	16.0	2.1	.0	90.0	1.0	59
33	TVVSP1-VVIT STATIC-RIGHT	122.1	6.2	1.1	105.0	129.0	123.0	29
34	TVVSP2-VVIT STATIC-WRONG	5.1	4.7	.9	.0	18.0	3.0	29
35	TVVSP3-VVIT STATIC-OMIT	1.8	2.2	.4	.0	7.0	.0	29
36	TVVDP1-VVIT DYNAMIC-RIGHT	76.9	27.5	5.1	22.0	126.0	76.0	29
37	TVVDP2-DYNAMIC-WRONG	9.4	6.3	1.2	.0	29.0	10.0	29
38	TVVDP3-VVIT DYNAMIC-OMIT	42.8	29.3	5.4	.0	105.0	43.0	29
39	TVVIR-VVIT RATER	16.3	9.6	1.8	7.0	50.5	13.5	29
40	TVVIS-VVIT SELF-RATING	15.4	7.5	1.4	5.0	33.0	15.0	29
41	TVVIP-POST-RATING	18.8	39.0	7.2	.0	180.0	4.0	29
42	SUM BVDT (30+31+32)	37.9	25.6	3.3	14.0	150.0	29.7	59
43	SUM VVIT (39+40+41)	50.5	47.4	8.8	15.0	214.0	35.0	29

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-XIII

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving P-3 training in Squadron VP-31.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	29.2	22.7	3.1	.0	80.0	22.2	53
2	BAS-AIRSICKNESS INDEX--W	13.7	11.5	1.6	.0	40.0	13.3	53
3	BAS-VOMITING INDEX-UW	12.6	15.6	2.1	.0	62.5	.0	53
4	BAS-VOMITING INDEX--W	6.9	9.3	1.3	.0	33.3	.0	53
5	BAS-PERF.DEGRAD.INDEX-UW	17.2	16.0	2.2	.0	50.0	14.3	53
6	BAS-PERF.DEGRAD.INDEX--W	7.9	8.0	1.1	.0	29.2	6.7	53
7	ADV-AIRSICKNESS INDEX-UW	3.0	6.2	.9	.0	23.5	.0	43
8	ADV-AIRSICKNESS INDEX--W	1.3	2.7	.4	.0	11.8	.0	43
9	ADV-VOMITING INDEX-UW	.5	1.7	.3	.0	5.9	.0	43
10	ADV-VOMITING INDEX--W	.3	.9	.1	.0	3.9	.0	43
11	ADV-PERF.DEGRAD.INDEX-UW	.7	2.3	.4	.0	11.8	.0	43
12	ADV-PERF.DEGRAD.INDEX--W	.3	1.1	.2	.0	5.9	.0	43
13	FRS-AIRSICKNESS INDEX-UW	12.9	14.1	1.9	.0	60.0	10.0	53
14	FRS-AIRSICKNESS INDEX--W	6.0	7.4	1.0	.0	30.0	3.3	53
15	FRS-VOMITING INDEX-UW	3.7	9.4	1.3	.0	50.0	.0	53
16	FRS-VOMITING INDEX--W	2.1	5.7	.8	.0	33.3	.0	53
17	FRS-PERF.DEGRAD.INDEX-UW	6.1	9.6	1.3	.0	37.5	.0	53
18	FRS-PERF.DEGRAD.INDEX--W	2.0	4.9	.7	.0	23.3	.0	53
19	MEAN-AIRSICK INDICES-UW	16.1	11.7	1.6	.0	45.0	15.8	53
20	MEAN-AIRSICK INDICES--W	7.5	6.0	.8	.0	21.7	6.7	53
21	MEAN-VOMITING INDICES-UW	6.0	7.6	1.1	.0	25.0	3.3	53
22	MEAN-VOMITING INDICES--W	3.3	4.3	.6	.0	16.6	1.2	53
23	MEAN-PER.DEGRAD.INDICES-UW	8.5	7.3	1.0	.0	23.9	6.7	53
24	MEAN-PER.DEGRAD.INDICES--W	3.9	3.7	.5	.0	14.4	2.5	53
25	TMSQ1-MS HISTORY, PART 1	11.4	10.7	1.6	.0	39.9	8.4	44
26	TMSQ2-MS HISTORY, PART 2	10.3	11.1	1.7	.0	38.6	8.4	44
27	TMSQ3-MS HISTORY, SUM	21.8	19.7	3.0	.0	78.5	16.9	44
28	TSANX-STATE/ANX.QUEST.	32.2	8.3	1.7	22.0	53.0	31.0	24
29	TTANX-TRAIT/ANX.QUEST.	30.1	6.4	1.3	21.0	48.0	29.0	24
30	TBVDR-BVDT RATER	13.7	4.5	.7	7.7	25.3	12.0	44
31	TBVDS-BVDT SELF-RATING	14.5	6.2	.9	5.0	27.0	14.0	44
32	TBVDP-BVDT POST-RATING	3.9	6.9	1.1	.0	33.0	2.0	42
33	TVVSP1-VVIT STATIC-RIGHT	119.8	11.0	2.2	84.0	129.0	123.5	26
34	TVVSP2-VVIT STATIC-WRONG	5.1	5.2	1.0	.0	18.0	3.0	26
35	TVVSP3-VVIT STATIC-OMIT	4.1	8.7	1.7	.0	39.0	.0	26
36	TVVDP1-VVIT DYNAMIC-RIGHT	77.2	28.3	5.5	10.0	122.0	72.0	26
37	TVVDP2-DYNAMIC-WRONG	8.7	4.5	.9	.0	17.0	7.5	26
38	TVVDP3-VVIT DYNAMIC-OMIT	43.1	30.2	5.9	2.0	116.0	48.5	26
39	TVVIR-VVIT RATER	17.0	5.9	1.2	9.0	31.0	16.0	26
40	TVVIS-VVIT SELF-RATING	15.9	5.8	1.1	6.0	29.0	16.0	26
41	TVVIP-POST-RATING	11.6	16.7	3.3	.0	66.0	6.0	26
42	SUM BVDT (30+31+32)	32.5	13.6	2.1	14.0	73.7	31.9	42
43	SUM VVIT (39+40+41)	44.6	21.8	4.3	17.0	102.0	37.5	26

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

TABLE A-XIV

Statistical listing of the flight response indices and laboratory test scores for the sample NFO population receiving S-3 training in Squadron VS-41.

RESPONSE VARIABLE NO.	DESCRIPTION	STATISTICAL PARAMETERS MEAN	S.DEV.	S.ERR.	MIN	MAX	MEDIAN	N
1	BAS-AIRSICKNESS INDEX-UW	13.0	12.5	2.1	.0	38.9	13.4	34
2	BAS-AIRSICKNESS INDEX--W	6.7	7.4	1.3	.0	23.5	4.6	34
3	BAS-VOMITING INDEX-UW	5.7	9.2	1.6	.0	25.0	.0	34
4	BAS-VOMITING INDEX--W	2.7	4.9	.8	.0	16.7	.0	34
5	BAS-PERF.DEGRAD.INDEX-UW	9.4	10.4	1.8	.0	30.8	5.9	34
6	BAS-PERF.DEGRAD.INDEX--W	4.6	6.0	1.0	.0	20.5	2.0	34
7	ADV-AIRSICKNESS INDEX-UW	6.2	7.6	1.3	.0	29.4	5.3	33
8	ADV-AIRSICKNESS INDEX--W	2.8	3.9	.7	.0	15.7	1.8	33
9	ADV-VOMITING INDEX-UW	2.3	4.8	.8	.0	17.6	.0	33
10	ADV-VOMITING INDEX--W	1.2	2.4	.4	.0	7.8	.0	33
11	ADV-PERF.DEGRAD.INDEX-UW	2.9	5.8	1.0	.0	25.0	.0	33
12	ADV-PERF.DEGRAD.INDEX--W	1.3	2.9	.5	.0	14.6	.0	33
13	FRS-AIRSICKNESS INDEX-UW	11.5	21.1	3.6	.0	100.0	.0	34
14	FRS-AIRSICKNESS INDEX--W	4.7	8.5	1.5	.0	33.3	.0	34
15	FRS-VOMITING INDEX-UW	2.7	9.6	1.6	.0	40.0	.0	34
16	FRS-VOMITING INDEX--W	.9	3.2	.5	.0	13.3	.0	34
17	FRS-PERF.DEGRAD.INDEX-UW	2.7	6.6	1.1	.0	20.0	.0	34
18	FRS-PERF.DEGRAD.INDEX--W	1.0	2.3	.4	.0	6.7	.0	34
19	MEAN-AIRSICK INDICES-UW	10.2	10.2	1.8	.0	37.7	8.5	34
20	MEAN-AIRSICK INDICES--W	4.7	5.1	.9	.0	18.4	2.9	34
21	MEAN-VOMITING INDICES-UW	3.5	6.4	1.1	.0	26.1	.0	34
22	MEAN-VOMITING INDICES--W	1.6	2.9	.5	.0	10.6	.0	34
23	MEAN-PER.DEGRAD.INDICES-UW	5.0	6.0	1.0	.0	18.6	2.7	34
24	MEAN-PER.DEGRAD.INDICES--W	2.3	3.1	.5	.0	11.7	.9	34
25	TMSQ1-MS HISTORY, PART 1	6.4	10.2	1.8	.0	33.8	.0	31
26	TMSQ2-MS HISTORY, PART 2	4.1	7.7	1.4	.0	30.9	.0	31
27	TMSQ3-MS HISTORY, SUM	10.5	16.4	3.0	.0	56.6	3.0	31
28	TSANX-STATE/ANX QUEST.	27.2	5.5	1.7	21.0	37.0	28.0	11
29	TYANX-TRAIT/ANX.QUEST.	27.0	4.0	1.2	20.0	33.0	27.0	11
30	TBVDR-BVDT RATER	13.3	5.0	.9	7.7	25.3	11.7	32
31	TBVDS-BVDT SELF-RATING	13.6	6.5	1.1	5.0	28.0	12.0	32
32	TBVDP-BVDT POST-RATING	2.4	6.0	1.1	.0	27.0	.0	31
33	TVVSP1-VVIT STATIC-RIGHT	120.8	8.9	2.6	101.0	129.0	123.0	12
34	TVVSP2-VVIT STATIC-WRONG	6.2	6.8	2.0	.0	22.0	5.0	12
35	TVVSP3-VVIT STATIC-OMIT	2.0	2.7	.8	.0	6.0	.0	12
36	TVVDP1-VVIT DYNAMIC-RIGHT	76.3	27.5	7.9	34.0	113.0	73.5	12
37	TVVDP2-DYNAMIC-WRONG	9.9	7.2	2.1	.0	20.0	12.0	12
38	TVVDP3-VVIT DYNAMIC-OMIT	42.7	25.0	7.2	.0	81.0	43.0	12
39	TVVIR-VVIT RATER	14.9	5.6	1.6	7.0	23.5	13.2	12
40	TVVIS-VVIT SELF-RATING	13.6	6.5	1.9	6.0	25.0	10.5	12
41	TVVIP-POST-RATING	5.7	8.7	2.5	.0	30.0	1.5	12
42	SUM BVDT (30+31+32)	29.5	13.7	2.5	13.3	80.0	26.7	31
43	SUM VVIT (39+40+41)	34.1	16.3	4.7	13.0	70.5	33.2	12

UW = UNWEIGHTED RESPONSE INDEX
W = WEIGHTED RESPONSE INDEX

APPENDIX B

Brief Description of Laboratory Tests Comprising the 1977-1978 Prototype Motion Sickness Sensitivity Test Battery

Variable No.	Symbol Code	Test Description
23 24 25	TMSQ1 TMSQ2 TMSQ3	Two-part motion sickness history form describing motion sickness incidence and exposure level. TMSQ1 summarizes the history before the age of 12 and has a minimum value of 0.0 denoting no problems and a maximum value of 180 denoting high susceptibility. TMSQ2 pertains to motion sickness experience following age 12 with the same minimum and maximum values. TMSQ3 is the numerical sum of the TMSQ1 and TMSQ2 scores. For details, see Reason, J. T., An investigation of some factors contributing to individual variation in motion sickness susceptibility. FPRC Committee Report 1277. London: Ministry of Defence, 1968.
26 27	TSANX TTANX	This State-Trait Anxiety Inventory is comprised of two self-report scales. The State Anxiety scale (TSANX) reqires the individual to report how he feels at that particular moment in time, while the Trait Anxiety Scale (TTANX) requires the individual to report how he generally feels. Both scales have a minimum score of 20, denoting minimum anxiety and a maximum score of 80 denoting maximum anxiety. For details, see Spielberger, C. D., Gorsuch, R. L., and Lushene, R. E., STAI Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologists Press, 1970.
28 29 30 31	TBVDT TBVDR TBVDS TBVDP	Brief Vestibular Disorientation Test (BVDT) involving cross-coupled angular acceleration stimuli produced by paced head motions on a rotating chair. TBVDT denotes the time of day the test was given based upon a 24-hour decimal clock. TBVDR is the test score given by the rating panel and has a minimum value of 6 denoting no motion symptoms and a maximum value of 60 denoting a maximal motion sickness reaction. Immediately following the BVDT, each subject rated his own reactions to the test coded as TBVDS with a minimum score of 7 indicating no reaction and a maximum score of 49 denoting high reaction. A report of aftereffects was obtained from the subject 24 hours later and coded as TBVDP with a minimum score of 0 denoting no aftereffects and a maximum score of 180 denoting a high level of aftereffects. For details, see Lentz, J. M., Holtzman, G. L., Hixson, W. C., and Guedry, F. E., Normative data for two short tests of motion reactivity. NAMRL-1243. Pensacola, FL: Naval Aerospace Medical Research Laboratory, 1977.

Variable No.	Symbol Code	Test Description
32	TVVSP1	These scores pertain to the task performance element of the Visual-Vestibular Interaction Test (VVIT). The tasks involve the visual scan, acquisition and identification of a complex numerical display. Under static conditions, TVVSP1 denotes the number of correct responses, TVVSP2 the number of incorrect responses, and TVVSP3 the number of omitted responses.
33	TVVSP2	
34	TVVSP3	
35	TVVDP1	The dynamic performance test scores TVVDP1, TVVDP2, and TVVDP3 describe the same response scores recorded while the subject undergoes passive sinusoidal rotation. For both the static and dynamic performance tests, the minimum scores within a given response category are 0 and 129, respectively, with the further condition that sum of the correct, incorrect, and omitted scores must total 129. For details, see Lentz, J. M., Holtzman, G. L., Hixson, W. C., and Guedry, F. E., Normative data for two short tests of motion reactivity. NAMRL-1243. Pensacola, FL: Naval Aerospace Medical Research Laboratory, 1977.
36	TVVDP2	
37	TVVDP3	
38	TVVIR	These scores pertain to the motion sickness symptom rating element of the Visual-Vestibular Interaction Test (VVIT). TVVIR is the test score given by the rating panel and has a minimum value of 6 denoting no motion sickness symptoms and a maximum value of 60 denoting a maximal motion sickness reaction. Immediately following the VVIT, each subject rated his own reaction to the test, which was coded as TVVIS, with a minimum score of 7 denoting no reaction and a maximum score of 70 denoting high reaction. A report of aftereffects was obtained from the subject approximately 24 hours later and coded as TVVIP with a minimum score of 0 denoting no aftereffects. TVVIT denotes the time of day the test was administered based upon a 24-hour decimal clock. For details, see Lentz, J. M., Holtzman, G. L., Hixson, W. C., and Guedry, F. E., Normative data for two short tests of motion reactivity. NAMRL-1243. Pensacola, FL: Naval Aerospace Medical Research Laboratory, 1977.
39	TVVIS	
40	TVVIP	
41	TVVIT	

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Mr. Hixson and Drs. Guedry and Lentz are with the Naval Aerospace Medical Research Laboratory, and Captain Holtzman is currently assigned to the USS Dwight D. Eisenhower, CVN-69, FPO New York 09501.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Naval aviation; Aviation medicine; Naval Flight Officers, Basic training; Aircrew performance; Attrition; Airsickness; Biomedical tests; Motion Sickness.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report documents the incidence and severity of airsickness experienced in 14 different fleet readiness squadrons (FRS) by 372 NFO students who flew a total of 8,325 hops during this phase of training. Treating this entire population as a single group, airsickness was reported to have occurred on 637 (7.65 percent) of the 8,325 hops, vomiting on 252 (3.03 percent) of the hops, and inflight performance degradation due to airsickness on 303 (3.64 percent) of the hops. Though these figures are lower than those reported previously for the primary and secondary phases of training, the FRS data showed

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significant variations according to the type-specific aircraft training pipeline followed by the students. Particularly noticeable were the high incidence rates occurring in the P-3 pipeline during FRS training. The report discusses probable causes for these pipeline variations based upon differences in the flight syllabi associated with each phase of training within a given pipeline. The report also relates student performance on the candidate motion reactivity tests to inflight airsickness performance during different phases of training.